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PIGMENTED STRUCTURAL GLASS AND THE STOREFRONT

SARA JANE ELK

A THESIS

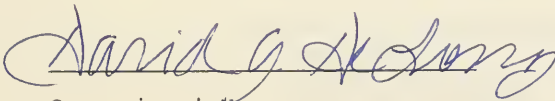
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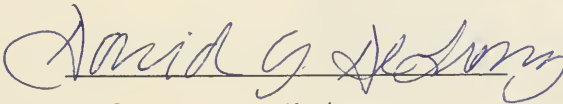
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Introduction

The period following the great economic Depression of 1929 saw the popular acceptance of one of the most decorative and versatile building materials to emerge in the revolutionary era of the modern movement; pigmented structural glass. Developed at the turn of the century, this opacified colored plate glass was first used in applications calling for cleanliness and sanitation. Drawing on the impervious properties of the glass, used for refrigerator linings, countertops or bathroom partitions, structural glass was an economical substitute for commercial applications of marble and ceramic tile. By the 1930s, however, its purely utilitarian qualities had been superseded by its aesthetic nature, leading to decorative architectural usage, especially in commercial applications.

Glass, pigmented structural glass specifically, offered seemingly unlimited possibilities. A versatile material, it could be cut, bent, lit, colored, etched and sandblasted, and its polished brilliance, combined with other gleaming twentieth century materials such as stainless steel, glass block, and neon, helped designers achieve the "modern" look they desired. Structural glass

began appearing on the exterior of buildings, transforming the facades of shopfronts and modernizing the streetscape.

Manufacture of pigmented structural glass ceased in the 1960's due to changes in taste and diminishing demand, leaving only what remains on streets throughout America as a reminder of the product and its place in commercial architectural history. This, along with the fact that production of structural glass occurred entirely in the twentieth century, pointed to a need for a comprehensive study of the product, both as a building material and as an expressive element which embellished architecture for period of nearly fifty years.

Chapter I of this study will explore the history, manufacture and specifications of structural glass, including the various American manufacturers. The origins of the application of structural glass as a sanitary material and its subsequent use as a exterior veneer will be considered in Chapter II, in which issues of "modern" design and "modernization" as they affected shopfront architecture will be discussed. Manufacturers, architects and the tradesmen each contributed to the promotion and use of the product, which will be examined in Part III.

A portfolio of Philadelphia area shopfronts, presented in Chapter IV, examines actual shops and buildings containing structural glass. This documentation of a specific period of shopfront architecture serves to illustrate the imaginative and practical use of the glass, as well its survival as a building product.

Finally, a case for preservation must be made before the best examples of pigmented glass shopfronts disappear. Not only must the shopfronts receive the needed recognition for their significance in the history of shopfront design, but the material itself represents the increased technological contributions made to American architecture by industry. Machine-made products used in an aesthetic manner could evoke the beauty of the emerging modern age.

During the year long period of this study, I observed many examples of shopfronts from the mid-twentieth century undergoing intrusive alteration, including several containing structural glass, decreasing the number of significant representative examples. In addition, the two major producers of structural glass report that they retained no pertinent records to contribute to the history of the product. These issues along with methods of maintenance, repair and protection will be noted in the Conclusion.

CHAPTER I STRUCTURAL GLASS - THE MATERIAL

Production of pigmented structural glass in the United States apparently began around 1900. ¹ The Opalite Tile Company of Monaca, Pennsylvania made a "pure white opaque glass for wainscotting, floor tiles, refrigerator linings, counter tops, operating tables, hospital fixtures, sink backs, low down tank tops and shelves," according to their advertisement in the 1909 Sweet's Catalogue. The Merrietta Manufacturing Company offered its structural glass in seven colors, each of which was available in five finishes, and suggested using it on walls and as toilet partitions. Two other companies submitted advertising to the 1909 Sweet's: New York Structural Glass, which produced "Cosmos" Sanitary Glass, and Pittsburgh Plate Glass, with Carrara glass. ²

Toward the end of the nineteenth century and into the early twentieth, products began to reflect the call for cleanliness and sanitation, stemming from scientific and medical discoveries linking germs and the spread of disease. Glass offers properties which fit these criteria, namely its imperviousness to moisture, resistance to most acids and its ease in cleaning.

In this case the aesthetic qualities of glass were

augmented by its scope for practical application. With opacity and color, this material became well suited as a decorative material while serving a practical function, finding applications in toilet rooms, restaurants and operating rooms.

It is not surprising that this opaque pigmented plate glass developed, considering the glass technology to that date and the particular demands of the period. Structural glass, as it was known generically, is the combination of two processes of glass production: that of pigmenting and opacifying glass and that of plate glass. Both had long been familiar processes to glassmakers.

A BRIEF HISTORY OF GLASS

Man may have first encountered glass 40 million years ago in the form of obsidian, a brown or brownish black substance formed by volcanic activity. Mesopotamians came close to producing glass in the 4th millennium B.C. with a substance known as faience, a low fired material of crushed quartz covered with an alkaline glaze. Had their fires been hotter, glass would have formed.³ Archaeological exploration has uncovered glass beads buried with a civilization dating back to 3000 years B.C.⁴

Early glass began opalescent and colored, as the technology of removing the extraneous compounds which prevented clarity took centuries to develop.⁵ The Egyptians usually receive credit for the development of color technology, although the early historian, Pliny, credits the Syrians.⁶ By attempting to imitate precious jewels, the Egyptian glassmakers were producing opaque glass in black, dark blue, bright blue, bright violet, dark green, light green, bright yellow, and bright red, perhaps as early as 1200 B.C.⁷

The use of glass in architectural applications lagged behind the technology of decorative glass, especially in the development of window glass. Casting as well as methods of pulling and blowing glass were perfected before glassmakers achieved transparency in their craft. Perhaps the mild climate of the early world contributed to the lag. Egyptians and the like had long used mica, alabaster and shells in window openings.⁸ Roman technology developed transparent window glass, yet it took four hundred years, from the first century A.D. to the fourth, to perfect the color from blue or brown to the light watery green of window glass as we know it today.⁹

As the Romans and Syrians migrated throughout Europe, they carried with them techniques of glass making, spreading the technology to the Rhineland and Gaul where the craft persisted through the dark ages. The Syrians' contributions led to the development of Venetian lenses and mirrors during the 14th century and of spun window glass in the 17th century. Germany and France, also influenced by Syrian technology, further perfected window glass, advanced largely due to the parallel increase in ecclesiastical demand.¹⁰

Two types of glass developed for the expanded window sizes of Gothic cathedrals directly predate the technology of plate glass. Both are methods of sheet glass production. Known as crown and cylinder, their processes involve the continued methodology of blown glass. Cylinder glass derives its name from the blown shape, a long cylinder, which is reheated, then cut with shears and flattened. [Figure 1] Crown, on the other hand, was blown into a global shape, cut and then spun until the globe opened into a flattened sheet of uniform thickness. Also known as bulls-eye glass, crown carries characteristic circular indentations found in the center of each piece, the result of the punty. [Figure 2]

The technique of plate glass production was developed in France in the later portion of the 1600s by a royal glassmaker charged with developing a reasonably priced and readily available supply of sheet glass.¹¹ The fashion prevailing at the time among the French nobility called for the embellishment of interiors with mirrors and coaches with portiers, demanding a large supply of glass. Prior to the development of domestic plate glass technology, sheet glass came from the glass centers of Venice and Nurenburch, at a substantial enough cost to demand better domestic production.

Plate glass technology involves the earlier method of casting. The French glassmakers cast the molten liquid into a frames, then using rollers, distributed the liquid evenly into the desired thickness. Grinding and polishing the surface completed the job. [Figures 1 and 2]



Figure 1. Early plate glass production

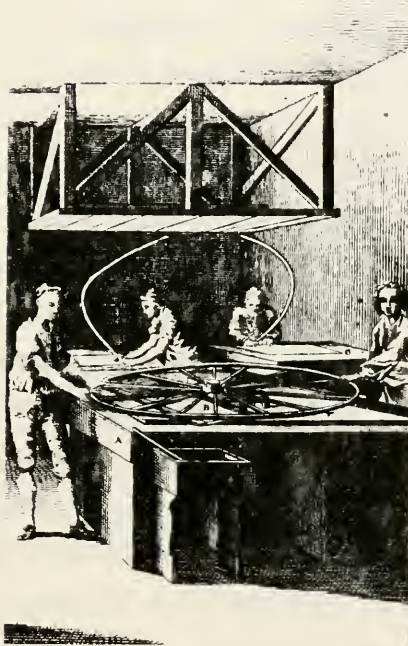


Figure 2. Early grinding and polishing of plate glass

THE PRODUCTION OF GLASS

The actual process of making glass, defined as vitrification, involves heating the silica-soda-lime mixture at a temperature near 2800 degrees. At that point it reaches a molten state and fusion of the elements takes place. Filled with tiny bubbles, the molten glass must go through a process known as fining to achieve a more uniform substance and to add quality to its form. Fining involves raising the temperature of the liquid, which floats the bubbles out the top of the surface where they burst.

If cooled too slowly or held at a semi-plastic state for an indefinite amount of time, the fusion within the liquid glass breaks down and various new chemical compounds crystalize out of the mixture. Known as devitrification, this state must be avoided or glass will not form.

Early glassmakers discovered that cooling glass too quickly deformed the shape of the desired piece, and developed a process knowing as annealing. Glass, still in a plastic state, is placed in a special oven, known as an annealing oven, or lehr, where the temperature is gradually lowered to control the cooling period.

During the late nineteenth century the English advanced glass technology by introducing mechanization for all methods of producing sheet glass: cylinder, crown and plate.¹⁴ By the 1920s, Ford Motor Company in America had developed a continuous conveyor belt method, reducing the time and manpower necessary to produce plate glass.¹⁵ The process involved heating the glass in large furnaces from which glass was poured out in a molten stream, in between a pair of rollers and out onto a rolling table. Still in a continuous process, the molten metal entered an annealing lehr.

Before the large furnaces came into use the pot was the prevalent vessel used in heating the raw materials needed to produce glass. From there the hot metal was poured or blown, depending on the desired form. Because of its specialized composition involving pigments, structural glass was produced in the pot method.

STRUCTURAL GLASS PRODUCTION

The following process for producing structural glass comes from the 1945 Glass Manual written and published by Pittsburgh Plate Glass.

Raw materials were stored in large storage containers which were open on the bottom to dump ingredients onto a conveyor belt. Taken to the batch mixer, the mixture awaited loading into the pot.¹⁶ Each furnace held 20 pots, in rooms of 4 pots each. Loading batch mix into the pots took place while they were in the furnace.¹⁷ The melting time in the pots took anywhere from 36 to 72 hours, depending on the type of glass. When the melt was finished the pot moved into a big soaking pit or tunnel, where the pot and molten glass cooled down for the casting or rolling stage.

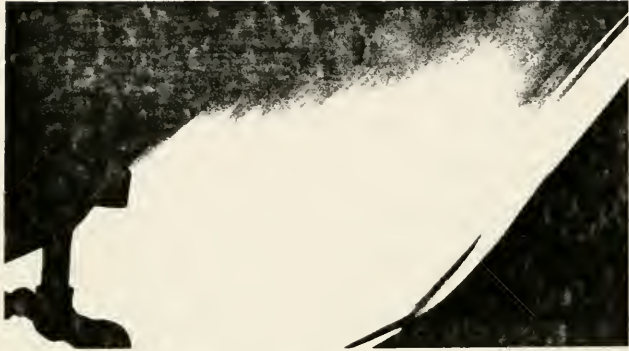
When the temperature reached the proper level, the pot was mechanically moved again to the rollers, where the molten liquid was poured onto rollers set one above another, but off center. When the mixture was rolled out into sheets, the glass then entered the annealing lehr, where it was cooled and made ready for inspection and

cutting. From casting to cutting, the process took one hour and forty minutes. [Figure 3]

From the rolling bed, the glass was taken to a long table covered with a thin layer of Plaster of Paris, in preparation for grinding and polishing. Large rollers pressed the glass into the plaster, squeezing out excess plaster until the glass lay flat against the deck. Small oak pegs were driven up through accompanying holes to further fix the glass in position. By that time the Plaster of Paris had set, readying the glass for the first step in polishing.

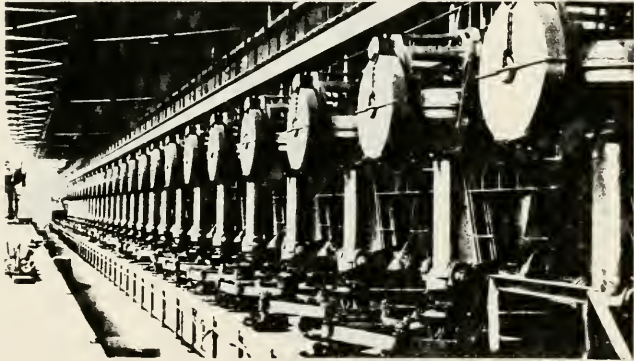
Sand or emery suspended in water were the abrasives used in that method. Both were previously prepared by machine-separating their particles into similar sized pieces. Even the emery, as fine as it was, was not completely consistent. The grinding heads were composed of cast iron, which pressed the abrasive into the glass, beginning with the coarsest sand. As the abrasive broke down, it chipped off the high spots on the glass surface. Progressively finer and finer sand was used, ending with the emery.

From the grinding tables, the glass moved along the line to the polishing room. Here cast iron wheels, called spiders (because of the polishing heads attached



As the glass flows smoothly (rolled out) from the furnace, it is being
 brought into the relation of glass flows smoothly into the annealing oven.

Figure 3. Glass flowing from the furnace to the annealing oven.



As each of the dimensions of the grinders and polishes may be adjusted to suit the
 surface of the glass, the grinding and polishing is done in a continuous manner.

Figure 4. Grinding and polishing of plate glass c. 1945

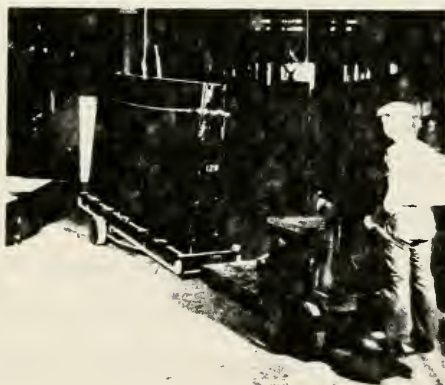


Figure 5. Structural glass ready for shipping

PIGMENTED STRUCTURAL GLASS SPECIFICATIONS

Manufacturers

Numerous companies manufactured structural glass in the early period of its use. By the 1930's when the material began to gain in popularity, fewer manufacturers took part in production.¹⁹ As the trend shifted to shopfront application, those companies offering tandem shopfront components became exclusive producers. The Vitrolite Company, a competitive producer in the 1920s, was acquired by Libbey-Owens-Ford (L-O-F) in 1935.²⁰ From that point, the production of structural glass remained in the control of two of America's largest glass producers, Libbey-Owens-Ford and Pittsburgh Plate Glass (PPG). L-O-F ceased production in 1958 and PPG at sometime in the early 1960s.²¹ Appendix A includes a list of manufacturers with product specifications.

Color

The pigmentation of structural glass was achieved through the suspension of particles within the matrix of the glass mixture. Because of the high concentration of pigmenting particles, light is unable to pass through the

glass. Instead it bounces around throughout the sheet, unable to maintain a straight course. This results in a product with a rich deep color present throughout the sheet. When polished, the depth of the color contributes significantly to the beauty of the product

The Marietta Manufacturing company listed eight colors in the 1909 Sweet's Catalogue, while the other companies only produced black and white. The variety and number of colors increased throughout the fifty years of structural glass production, reflecting architectural and stylistic trends, as will be shown in Part II. A total of thirty-six different colors were produced, including variegated colors resembling marble. Refer to Appendix B for the chronology of color and technical specifications.

Size and Shape

Structural glass was produced in thicknesses ranging from 1/4" to 1 1/4", and varied from company to company. Standard sheet sizes also varied, depending on the particular application. For example, storefront sizes differed from toilet partition and ashlar, which was cut at the factories and came in different dimensions.

With technological advances, bending glass became economical. For shopfront application, manufacturers required custom orders. Specific information on size pertaining to manufacturers can be found in Appendix C.

Finishes

Depending on the amount of gleam desired on the glass, structural glass came with finishes ranging from a high gloss to a rough finish, most all achieved in the polishing process.

The height of its popularity coincided with improved methodology in plate glass, which produced an almost perfect surface directly from the annealing lehrs.²² Libbey-Owens-Ford named this finish fire-polish, and it was exclusive to many of its colors.

Other finishes included polished, suede, flame glaze, matte, polychrome, embossed, tiffanyfaience, natural, velvet, honed finish and satin. A more complete list of these finishes and accompanying manufacturers appears in Appendix D.

A distinct difference occurs on the secondary side of each sheet between the PPG and L-O-F glass. The surface of Vitrolite (L-O-F) was manufactured with ridging, begun by the Vitrolite Company, in an attempt to provide a more fusable surface for installation. As a stock item, Carrara (PPG) had an unpolished surface on one side; however it could be ordered with a polish on both sides.

Decorative Finishes

The most common decorative finish treatment was achieved with sandblasting, either at the factory or by independent craftsmen. During the 1930s Vitrolite advertising included examples of highly decorative sandblasted finishes. [Figure 6] Also used in sign bands, the letters of the name were sandblasted, and if desired, painted or leafed for a more distinctive contrast. [Figure 7]

Earlier advertising by the Vitrolite Company in the 1922 Sweet's Catalogue promoted decorating Vitrolite with paint. At that time, Vitrolite produced only white glass.

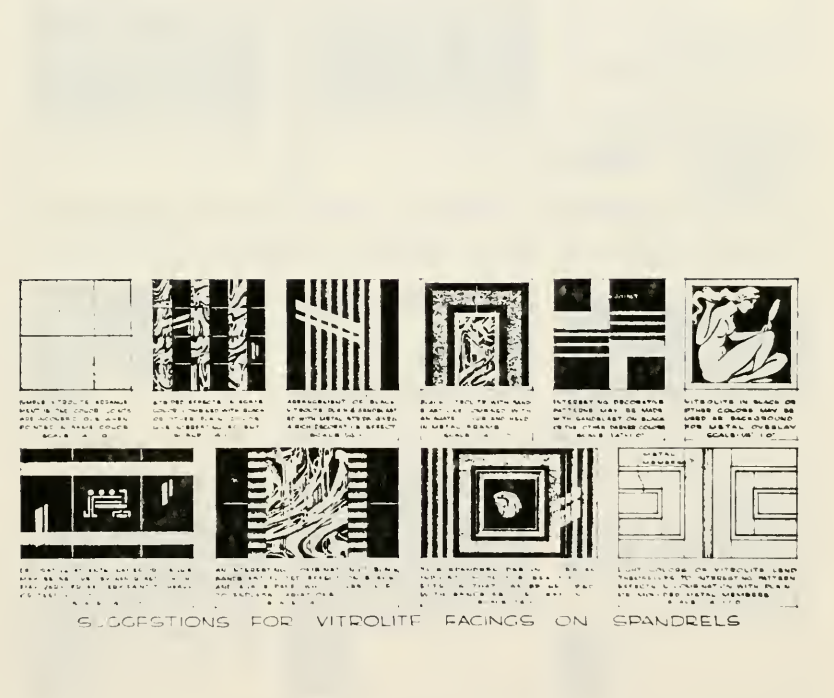




Figure 7. "Suggestions for Vitrolite facing of show windows"

Installation

Structural glass was attached to masonry or other smooth surfaces with mastic cement, supplemented with invisible shelf angles. Caulk, joint cement or cork tape was recommended for the joints between the glass slabs. Because expansion rates of glass and the walls of the building differed, a gap of at least 1/8" and not to exceed 3/8" was necessary between the building and the glass. Later applications, after 1940, often included visible metal supports under the horizontal joints, known as "J" bars.

No edges were to be left exposed; rather all should have been placed under masonry or extruded metal moldings. See Appendix E for illustrations of proper installation.

Interior installation was similar to that of the exterior, except that, with factory drilled holes, slabs could be screwed to furring strips. Decorative rosettes provided finish to the installation. Appendix E provides details and illustrations.

NOTES TO CHAPTER I

- 1 I corresponded with Pittsburgh Plate Glass and Libbey-Owens-Ford concerning production dates for Carrara Glass and Vitrolite. Neither company has retained documents or archival material pertaining to this product which indicate the beginning of production. According to the 1945 Glass Manual, published by Pittsburgh Plate Glass, the technology for the development of Carrara glass began in its Brussels plant, which had been acquired in 1902.
- 2 Sweet's Catalogue Service, Sweet's Catalogue File (New York: F. W. Dodge Corporation, 1909)
- 3 Charlene Edwards, Corning Museum of Glass: Survey of Glassmaking from Ancient Egypt to the Present (Chicago: University of Chicago Press, 1977), p. 3
- 4 Ibid.
- 5 Ibid.; Raymond McGrath and A. C. Frost, Glass in Architecture and Decoration (London: The Architectural Press, 1937), p. 5.
- 6 McGrath and Frost, pp. 3-5. The authors suggest that ancient glassmakers had a tabu against transparent glass, which may have caused a lag in that aspect of glassmaking technology.
- 7 John Bostock and H.T. Riley, The Natural History of Pliny, 1857), vol. VI, p. 379.
- 8 McGrath and Frost, p. 5.
- 9 Ibid., p. 6.
- 10 Pierce Davis, The Development of the American Glass Industry (Cambridge, Massachusetts: Harvard University Press, 1949), p. 6.
- 11 Ibid., p. 11.
- 12 Ibid., p. 41; McGrath and Frost, p. 14, Both sources name Colbert as the noble charging the

glassmakers with the development of plate glass, although they differ in the name of the man achieving the royal task. McGrath and Frost credit Louis Lucas de Nehou, a Norman, in 1675, and Davis identifies Thevart, in 1688.

- 13 Pittsburgh Plate Glass Company, Glass Manual and McGrath and Frost relate the importance of the percentage of lime in the mix. More than twenty percent will produce waterglass, which is not as impervious to moisture. Much of the glass used in midaeval churches fits this description and shows signs of clouding and pitting from normal weather exposure. (p. 27)
- 14 Davis, pp. 272-273.
- 15 McGrath and Frost, p. 38.
- 16 Glass Manual, p. 26. Pots during the 1940s weighed two tons a piece and held 2 1/2 tons of glass. The sheet made from one pot covered an area 132" x 65'.
- 17 Glass Manual, p. 25. Pots were manufactured in the factories and awaited use in case one in the furnace failed. They were kept as hot as the furnace, so a quick substitution could be made.
- 18 Rouge used in glass polishing consisted of chemically prepared ferrous oxide. Mixed with the correct amount of water, it provided a soft but abrasive compound which effectively polished the glass.
- 19 I consulted sources such Sweet's Catalogue Files, advertising in several architectural periodicals, and Pittsburgh Plate Glass and Libbey-Owens-Ford advertising documents and annual reports for the determination of manufacturers and their complete lines of products.
- 20 Libbey-Owens-Ford, Annual Report, 1935.
- 21 No documents, archival literature, or company literature revealed to this author the exact date Pittsburgh Plate Glass ceased production of Carrara glass.

- 22 Libbey-Owens-Ford, Vitrolite in Architecture and Decoration, (n.p., 1937), p. 2.

CHAPTER II THE MATERIAL - ITS ASSENT TO POPULARITY

Although sanitation might appear far removed from the study of the streamlining of the 1930s, an understanding of the changing attitudes to sanitation is necessary to the understanding of the development of pigmented structural glass.

In addition, a survey of shopfront design from the mid-nineteen teens to the end of the 1950s lays the background for its rise in popularity.

Woven into the history of structural glass application is the role of industry and its technological contributions to building products. A synopsis of the relationship of industry to storefront design contributes to the story.

A BRIEF HISTORY OF SANITATION

Mid-nineteenth century reformers in Western Europe and the United States sought to increase public awareness of the symbiotic relationship of sanitation and health. In 1861, the sudden death of Prince Albert of typhoid fever brought the matter of improper sanitation to international attention. The Prince Consort's death shocked the general public into realizing that diseases such as typhoid, rampant in urban areas and were not just the curse of the poor and destitute. ¹ The reformers, often working against superstition and ignorance, formed powerful worldwide movements providing public water supplies and sewage disposal systems to protect its citizenry. While acceptance in Europe was relatively swift, the United States in comparison lagged far behind. Using British standards as their models, American reformers succeeded in establishing public health legislation. The City of New York in 1866 passed a landmark sanitation law that became a model for the rest of the nation. ²

Initial attempts to design safe and efficient water and sanitation facilities often failed. The ad hoc nature of these early experiments led to the creation of

a new profession and industry based on a scientific model and approach. It was in this period of rapid change that the profession of sanitation engineer emerged and the beginnings of the modern plumbing trade was established. Here and abroad, published reports led to continued improvements in the public as well as household sanitation systems. Increased specialization led to treatises such as T. Pridgin Teale's 1878 Dangers to Health: A Pictorial Guide to Domestic Sanitary Defects. Teale's publication dealt explicitly with sewer gas, the odious by-product of indoor plumbing thought to be responsible for a variety of illnesses. The pictorial guide, one of the most influential publications on the subject, helped guide plumbers towards the modern system of venting and trapping of the pipes.³

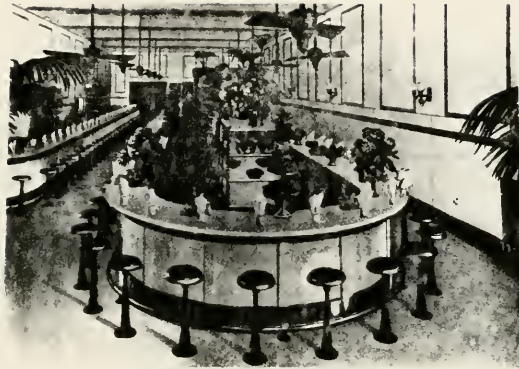
The development of an impervious material impregnable to bacteria evaded the industry until the turn of the century. It was not until the 1890s that odorless, impervious, vitreous-lined sinks, bathtubs and toilets became commonplace domestic features replacing the earlier earthenware and marble basins.⁴ This lag is explained in part by differing theoretical beliefs. The early notion of the spread of disease via noxious odors and materials, known as the "filth theory", was finally

displaced following Louis Pasteur's work on the relationship of bacteria and disease.⁵ Concurrent with these advances in scientific knowledge was the equally important notion of consumer taste and the demand for vitreous fixtures.

White vitreous-lined bathroom fixtures and the practice of sterilization in the operating room gave new meaning to the color white, which came to represent purity from germs and contagion as well as moral virtue.⁶

STRUCTURAL GLASS AS A SANITARY PRODUCT

Advertising in the Sweet's Catalogues beginning in 1906 and following through the early 1920s espoused the desirabilities and properties of structural glass as a sanitary material. These catalogue entries describe the glass's impervious nature to moisture and formation of undesirable odors, resistance to crazing (the appearance of small cracks on a ceramic surface), and ease in cleaning. Because of these properties, structural glass made an especially good material for toilet room partitions, as opposed to the more expensive and porous alternative of marble and ceramic tile. The general acceptance of the material was demonstrated by architect Cass Gilbert's specification for the installation of structural glass in the lavatories of the 1913 Woolworth Building in New York City. Other prominent architects included the use of structural glass for toilet rooms as well as barber shops and commercial kitchens.⁷ Manufacturers suggested even more uses related to cleanliness, including "table tops, countertops in restaurants, drug stores, butcher shops, markets and other places where food products and beverages are dispensed".⁸ [Figures 8 and 9] In addition, promotional literature illustrated hospital



"Spotless Appointments Put an Edge on Appetite"

Here is shown an interior view of a modern restaurant. The surrounding and side area of the island is the Black Color, being the most brilliant and clean. The island is decorated with plants and figures. The Black Color is the most brilliant and clean. The island is decorated with plants and figures. The Black Color is the most brilliant and clean.

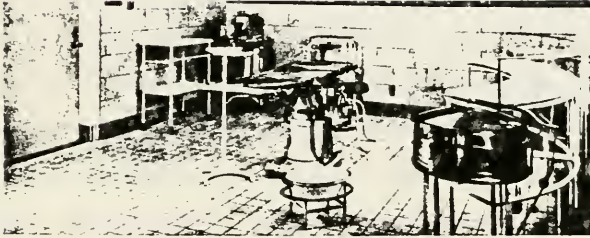
Figure 8. "Spotless appointments put an edge on appetite"



An Attractive Fountain

The soft service necessary at most soda fountains calls for a surface that can be cleaned easily and quickly. Polished Carrara marble is ideal. The painting of fountains with Black Color base and trim gives a strikingly brilliant effect.

Figure 9. "An attractive fountain"



VITROLITE IN THE MAJOR OPERATING ROOM



NURSERY WITH VITROLITE WAINSCOT



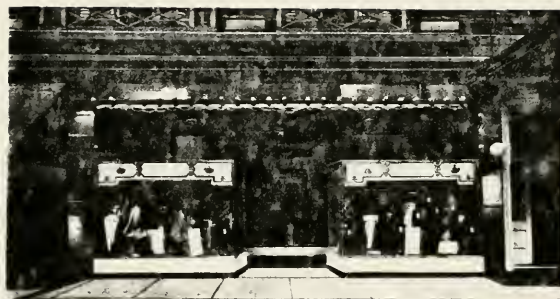
VITROLITE WAINSCOT IN MINOR OPERATING ROOM

Figure 10. Vitrolite in the hospital

installations featuring structural glass in operating rooms and hospital areas where sterilization of surfaces was imperative. [Figure 10] Also promoted, with increasing frequency in the second decade of the century, were decorative architectural components as an alternative for marble and ceramic tiles used in floors, wainscotting, ceilings and doorframes. Yet the advertising continued to promote the vitreous properties which made the material appropriate in areas requiring cleanliness or ease of cleaning.

Early product illustrations for commercial use show structural glass used in store bulkheads, areas which need frequent cleaning - suggesting that the inherent impervious nature of glass, for the moment, overrode its property of beauty.

... Carrara Glass and Black Glass are well represented in this illustration of a store front. The base of the window upon which the frame rests is of Carrara with a strip of Black Glass at the bottom. Marble often is used for a similiar purpose, but Carrara has been found greatly superior. Construction of this sort has to be cleaned frequently--as a rule every morning--and it is essential that the material be impermeable to dampness.⁹ [Figure 11]



Impermeable to Dampness

The resplendence of Carrara glass and Black Glass are well represented in this illustration of a store front. The lines of the window openings, the trimmings used in Carrara with a strip of Black Glass at the bottom. Marble columns used for entrance purposes. Carrara has been found greatly superior to other materials for this purpose. It is not only beautiful but also durable and essential that the material be impermeable to dampness.

Figure 11. "Impermeable to dampness"



Carrara and Black Glass Signs

This illustration shows an interesting and effective use of these two glasses for store front decoration and advertising. The pattern of the lettering is sandwiched on the highly polished black or white surface and paint or stain is then applied.

Figure 12. "Carrara and black glass signs"

Later the glass began appearing as a decorative element used in signbands and surrounds for display windows. In 1923, a Pittsburgh Plate Glass publication featured an expansive shopfront which utilized Carrara glass for both its utilitarian and decorative properties.

This building shows an interesting and effective use of these two glasses for store front decoration and advertising. The pattern of the lettering is sandblasted on the highly polished black or white surface and paint or stain is then applied.¹⁰

The use of black and white in these Carrara installations was typical of the early twenties.¹¹ By the end of the decade, however, the range of colors had expanded noticeably. Producers advertised a selection of colored structural glass which included, in addition to the standard black and white, ivory, gray, blue, lavender, and two hues of green. The expansion of color choices indicates that the decorative quality of the material had surpassed its attraction as a sanitary material. Supporting this theory was the increased attention to detail in installation. In interiors, for example, color-coordinated ceramic rosettes were a suggested method for fastening the glass; employing tinted joint "caulk to match the color" of the glass resulted in a uniformly reflective surface.¹²

Ornamental effects such as the art of sandblasting designs or lettering in the glass began appearing in the manufacturers literature by the early 1930s.¹³

Recommended as a decorative way to advertise or simply to embellish the glass, the manufacturers depicted lavish use of sandblasting for decorative designs to a store facade. [Figure 11]. One of the oldest surviving examples of structural glass storefront applications known in Philadelphia, the Theodore Sloan Jewelry store, applied in 1935, contains floral designs sandblasted in black Carrara glass applied above the shop windows.]. The Vitrolite Company offered a variety of sandblasted glass, in a fluted pattern, which is found in situ on another early shopfront.¹⁴ Miller's, 4861 North Fifth Street, contains not only factory sandblasted sheets in an interesting pattern, but is one of the few Philadelphia examples showing the variegated colors. [Figures 49 and 50]

The technology of bending glass, chiefly due to the changing shape of the automobile, became commercially available in structural glass toward the early part of the 1930s.¹⁵ Increasing the flexibility of the glass in veneer application, this new smooth, streamlined shape came to characterize the mode of the 1930 to 1945 shopfront, symbolizing new, modern and fashionable.

Structural glass as a product was about to come of age. A transformation culminating in architectural design met with a nation recovering from a devastating Depression. As designers and merchants looked toward the future, products and shapes which represented new and modern ideas became the favored expression of the times. Glass was a material that fit the criteria. It held beauty as a machine-made building product, espoused by modern architects. It also conformed to a variety of shapes and illumination, held as symbols of technological achievement. Structural glass with properties of imperviousness and practicality, and now representing a new age, began appearing in storefront modernizations across America. As if to predict its successes, Frank Lloyd Wright, in 1928, stated,

The sense of glass as the crystal has not yet to any extent entered into the poetry of architecture. It is too new, for one thing. For another thing, tradition did not leave any orders concerning it. It is strictly modern. Therefore, let us try to understand what it is. The machine has given to architects, in glass, a new material with which to work. All the diversity of color and texture available in any material is not only available but imperishable in glass...the machine can do anything in glass - thick, thin, colored, textured to order - and cheap. A new experience is awaiting him. ¹⁶

INFLUENCES ON SHOPFRONT DESIGN 1930-1945

Shopfront design following the Depression began reflecting the influences of prevalent architectural trends, developing as modern design in a modern age. Concurrently, economic developments fueled by New Deal legislation and then later by the end of World War II led to a nationwide movement to modernize shops and streetscapes.

Modern Design and the Machine

What is commonly termed "modern" in architectural design found its antecedents in the closing decades of the nineteenth century. This revolution of design was closely tied to the evolution of societal change brought on largely by the industrial revolution. Although strong pre-modern influences could be found in American architecture by the turn of the century, the promise of a new architectural era such as that demonstrated by the Chicago school was not fully realized until the years following the Depression. Architects, confronted with new ideas in addition to developing a new vocabulary for a new age, developed new materials with which to express their visions.¹⁷

A great epoch has begun. There is a new spirit. Industry, overwhelming us like a floor which rolls on toward its destined ends, has furnished us with new tools adapted to this new epoch, animated by the new spirit.¹⁸

The new tools or technology available to architects, such as steel frame construction, gave new freedom to the choice of surface materials, lightening the visual building mass.¹⁹ Utilizing advances in construction and industrial technology, architects began to design with reinforced concrete and glass, experimenting with the forms and shapes allowed by machine-made materials, giving rise to a new discipline.

Modern design became part of American culture largely through changes in the appearance of industrial products such as automobiles and household appliances, transformed by industrial designers. Design and trade exhibitions further advanced the age of modernism by exposing masses of people to current trends in architecture, technology, industry and science.

Industrial Design

Norman Bel Geddes opened an office in 1927 for the purpose of designing primarily for industry, giving credence to the profession of the industrial

designer.²⁰ His contemporaries included Raymond Lowey, Henry Dreyfuss, and Walter D. Teague.²¹ Designing cars, trains, and planes, attention was given to the principles of air flow, efficiency, speed, and minimum resistance, leading to the smooth form with sweeping curves characterized as streamlining.

An object is streamlined when its exterior surface is so designed that upon passing through a fluid such as water or air the object creates the least disturbance in the fluid in the form of eddies or partial vacua tending to produce resistance. In other words, an object is airfoiled in order to create a disturbance and an object is streamlined in order to eliminate disturbances in the media through which they pass.²² [Figure 12]

It should be noted that static objects were treated in much same way as those intended to be viewed or seen in motion. This apparent dichotomy often extended to the shapes and forms found in buildings. [Figure 13] Raymond Lowey directed streamlined shape to shopfronts through his design for the national chain of Cushman Bake Shops and Texaco Gasoline Company.²³ [Figure 14]

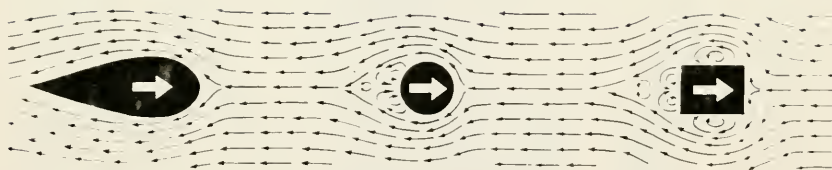


Figure 12. Norman Bel Geddes, "Diagram illustrating the principle of streamlining"

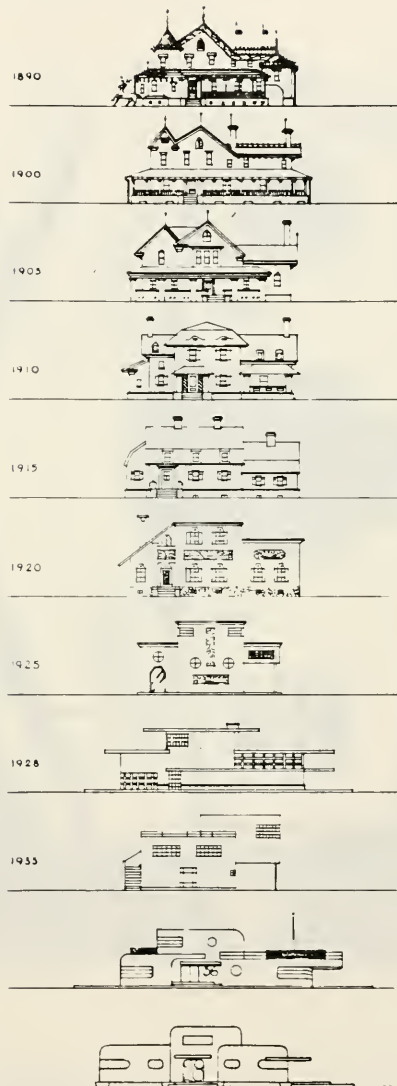
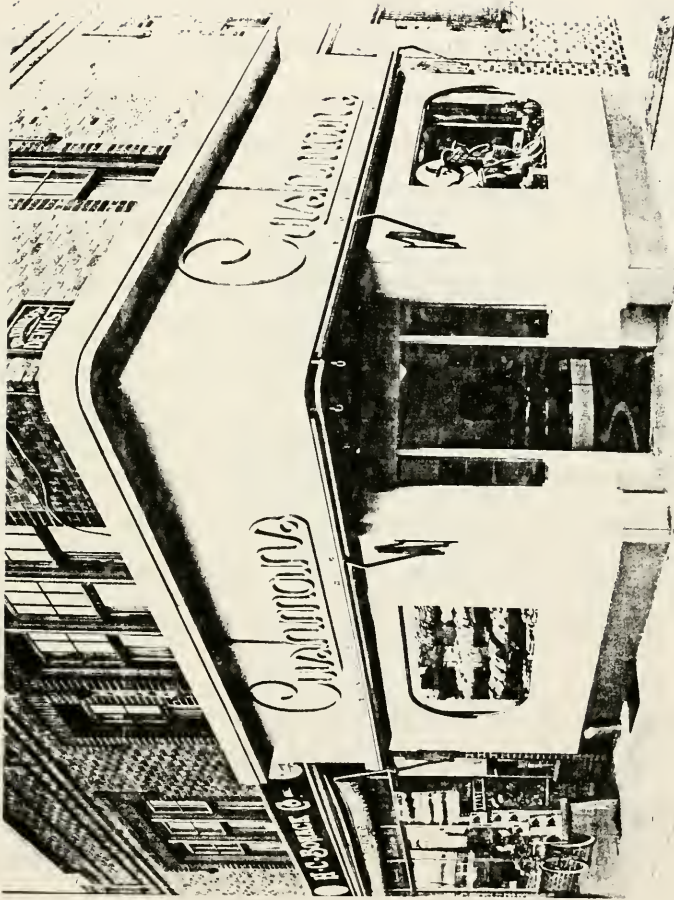


Figure 13. Raymond Lowey, from series of evolution charts



Raymond Lowey's storefront for Cushman's Bake Shop in New York (1937), and its hundreds of imitations across the Nation, introduced countless Americans to their first taste of "the modern."

Figure 14. Raymond Lowey's streamlined storefront for Cushman's Bake Shop

Design and Trade Exhibitions

World's fairs, industrial trade shows, expositions and exhibits brought contemporary design and technical advancements into the spotlight. Espousing the modern look in architecture, the events touted a vision of the future by featuring fantastic monuments to industry and science. 24

The 1925 Paris Exposition des Arts Decoratifs et Industriels received the critical attention of architectural and art reviewers in America. The exposition was the touchstone in bringing the trend in contemporary design European to the United States. Critical attention was focused on several pavilions which featured smooth surfaces achieved by such materials as reinforced concrete and marble; the emphasis on material not ornament.

Examples of Parisian shopfronts, in the latest mode, on the Esplanade des Invalides caught the attention the American audience. Writers and critics featured these shopfronts in contemporary books and periodicals. The appearance of "Paris chic" on New York Streets, soon after, testified to the allure of the "new style" to the fashion conscious retailing community.²⁵ Parisian shops of this mode were characterized by simple compositions, incorporating the shop name into the design.

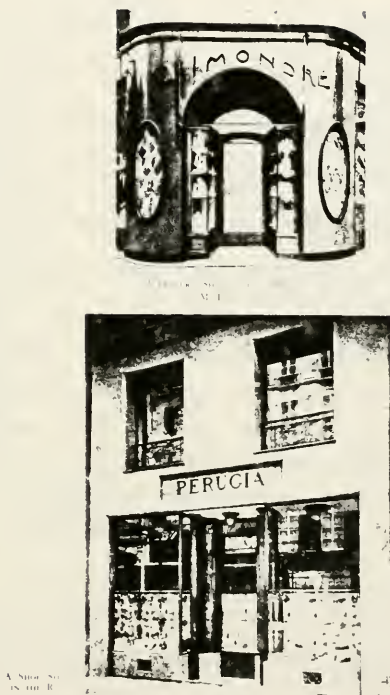


Figure 15. Parisian shopfronts

Constructed of elegant expensive materials such as marble, cast stone or glossy metals and glass, the surfaces were smooth without a great deal of ornament. [Figure 15]

An exhibit of current European architecture came across the Atlantic to the Museum of Modern Art in 1932, organized as the International Exhibit by Philip Johnson and Henry-Russell Hitchcock. Work by forty architects from fifteen countries demonstrated a departure from traditional designs, characterized by,

...first, a new conception of architecture as volume rather than as mass. Secondly, regularity rather than axial symmetry serves as the chief means of ordering design. These two principles, with a third proscribing arbitrary applied decoration, mark the productions of the international style.²⁶

Shop design from Dutch architect J. J. Oud and filling station design from German architect Hans Borkowsky appeared in the concurrent publication, The International Style by the exhibit's curators. Both examples show regularity and standardization in form, as well as use of lighter surfaces - exploited the more practical and economically affordable materials, still devoid of ornament. [Figure 16] This more austere approach to



Figure 16. J. J. P. Oud, architect, Holland, location unidentified.

shopfront design differed from that proponed by the "Paris chic", and would become more prevalent in architect designed shops following World War II.²⁷ The two modes combined together gave credibility to forthcoming appearance, utilizing such practical yet rich materials such as structural glass.

To the theme of science and industry, the Century of Progress Exhibition opened in Chicago in 1933. With an eye to the future, the official guide book compared life one hundred years earlier to the accomplishments of the the present day, citing transportation, communication, science and industry as the forces correcting the world and steering it toward a promising future.²⁸ The architecture lining Lake Michigan featured surfaces of unbroken planes and featured buildings with color and illumination.

The New York World's Fair of 1939-40 contained "architecture ...of modern lines, studied optical illusion, breathtaking vistas and downright madness."²⁹ The Glass center, containing exhibits from the major American glass companies, was constructed of glass block, plate glass and structural glass.³⁰ [Figure 17]

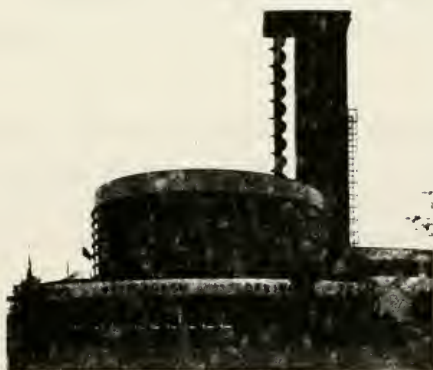


Figure 17. The Glass Center, New York's World Fair,
1939-40

MODERNIZATIONLegislation and the Modernize Main Street Competition

Following the devastating effects of the Great Depression, the New Deal legislation provided the framework for the "modernization" movement. A June 1934 article in the Architectural Record called "A Four Point Plan for Building Trades Recovery" relayed the news that President Roosevelt's message had arrived in a Congress, proposing a national housing program and "reasonable credit terms:

After five years of neglect of the ordinary maintenance of our residential, commercial, and industrial properties, a widespread potential demand now exists for construction in the fields of repair, renovation and modernization. A Modernization campaign and a plan of home-improvement credit have been proposed as a means of inducing the prompt undertaking of this work. The modernization project would embrace commercial and industrial property as well as residential property. ³¹

In 1935 Libbey-Owens-Ford sponsored the "Modernize Main Street" design competition, in conjunction with the Architectural Record. As a part of the competition literature, information concerning Federal Housing Authority financing accompanied advice on the importance of good merchandizing practices, namely modern store design. The words "modernization" and "recovery" were often used in the same sentence.³² The competition began July 15, 1935 and closed August 12, 1935 with the selection of four first prize winners and runners-up in categories of Food Store, Drug Store, Apparel Shop and Automotive Sales and Service Station modernization. [Figures 19, 21, 23]

The jury consisted of Melvin T. Copeland, Albert Kahn, William Lascaze, John W. Root, F. R. Walker, Kenneth C. Welch and J. Andre Fouihoux, chairman.

The Jury believes that this competition should have a farreaching [sic] effect on raising the standards of store design, both through directing the interest of the designers to this field, and by providing merchants and dealers with a guide as to what an intelligent public taste will demand.³³

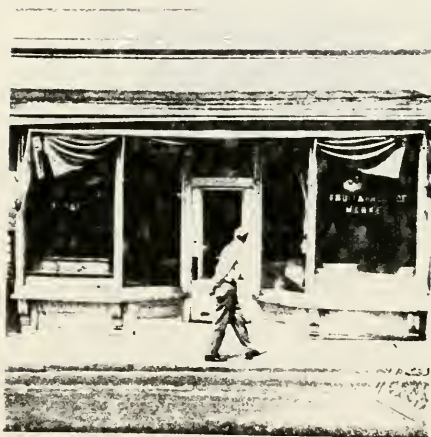


Figure 18. Modernize Main Street Competition, food store problem,

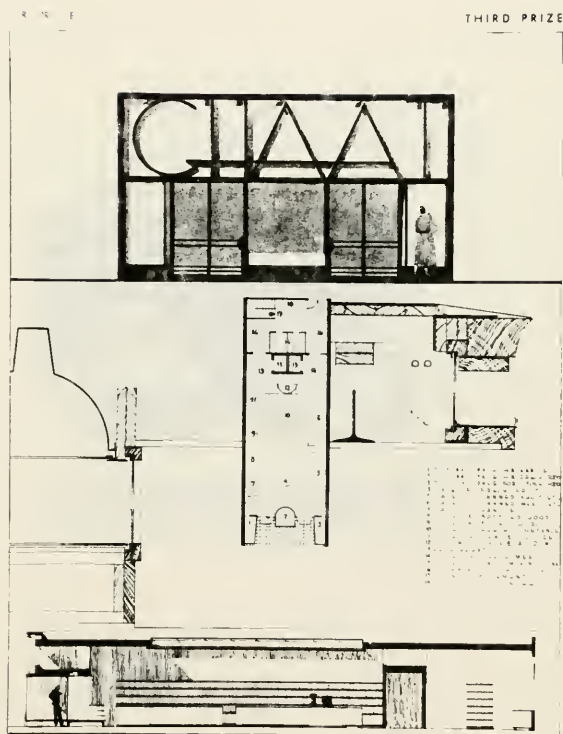


Figure 19. Modernize Main Street Competition
Third prize winner, food store, J. R. Sproule

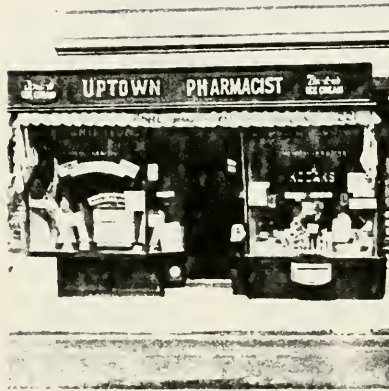


Figure 21. Modernize Main Street Competition
Drug store problem

C. F. HARRELL, JR.

SECOND PRIZE

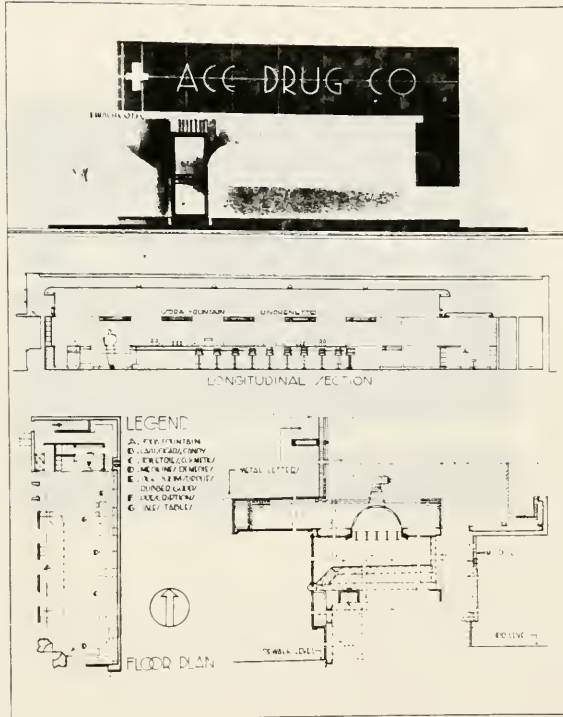


Figure 22. Modernize Main Street Competition
Second prize winner, drug store,
G. Foster Harrell, Jr.

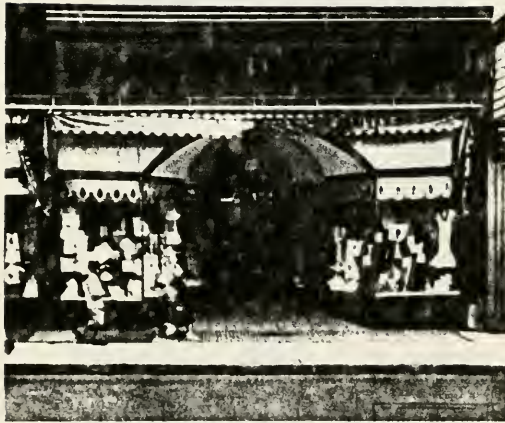


Figure 21. Modernize Main Street Competition,
apparel shop problem

SUREN PILAFIAN MAURICE LUBIN

FIRST PRIZE

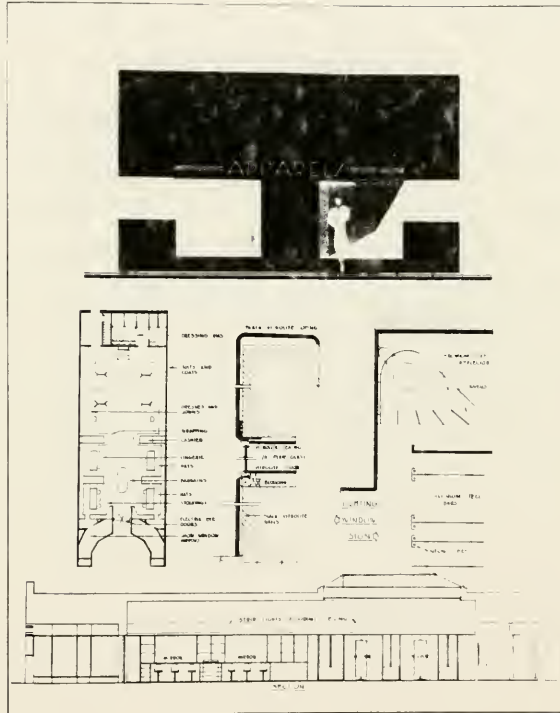


Figure 23. Modernize Main Street Competition
First prize, apparel shop, Suren Pilafian,
Maurice Lubin

FEDERAL HOUSING ADMINISTRATION

Washington

Stewart McDonald
Acting Administrator

June 1, 1935

Mr. John D. Biggers, President
Libbey-Owens-Ford Glass Company
Toledo, Ohio.

Dear Mr. Biggers:

Your new "Modernize Main Street" Architectural Competition is a most constructive and timely development in the growing interest in modernization and rebuilding construction.

Your plan will stimulate the interest of many architects and builders and will encourage the specific action of business property owners throughout the country.

Widespread examples have already come to our attention of money income resulting from modernization of business premises. The provisions of the National Housing Act to permit insured mortgage loans on business property up to \$50,000 greatly increases the scope of new construction in the Federal Housing Administration.

Under the National Housing Act, working capital loans may be made, and improvements may be insured up to 20% of the value of the property on business property and may be insured as business mortgages.

You may be assured of our full cooperation and assistance in any contribution you are making.

With every wish for the success of your program,

Sincerely,

STEWART McDONALD

Figure 24. Federal Housing Administration letter to Libbey-Owens-Ford concerning Modernize Main Street Competition

The designs of both the prize winners and other entrants demonstrate that "modern" design was an accepted form with designers. Many of the entrants' designs reflect European shop design, while others spoke of the streamlined form. [Figures 19, 21, 23]

On May 28, 1935, the eve of the Modernize Main Street competition, an amendment to the National Housing Act passed Congress, permitting the issuance of modernization loans up to \$50,000. [Figure 24] In 1936 the Department of Commerce analysed the physical appearance of 8,000 small and medium-sized stores located in the western part of the country and determined that more than half of them needed modernization in varying degrees. The report noted that storefronts needed attention, such as the addition of neon signs and entrance steps, as well as improvement in lighting and general upgrading of the interiors to include washrooms, telephones and modern fixtures.³⁴

Books and Periodicals Promoting Modernization

The current trend of modernization gave rise to writings on the subject. A wealth of publications and articles soon became available to aid the architect, contractor or

shop owner in planning a modern store, both inside and out.

Frederick Keisler in his 1930 Contemporary Art Applied to the Store and its Display, promoted "a sound cooperation between public, artist and industry." ³⁵ Attention must be paid to good modern design, he explained. Architecture is an applied art, a bridge between fine art and daily life. Therefore, the new emerging art could be promoted through good shopfront and store design, as well as window displays, as shopping was an essential part of everyday life. ³⁶

In designing the storefront, he stressed the importance of deviating the entrance by recessing it or shifting the door off center to create more window space and interest for the shopper. Rounding out the window at the entrance and funneling the shopper into the store, "draws the customer in with a suction-like power and the doorway is so far removed from the street that the door can be dispensed with. Window and door have become one." ³⁷ He also introduced an idea that allowing the potential customer to see into the interior of the store increased the inducement to enter. This was achieved by eliminating the screen at the back of the display window near the doorway, allowing the customer to visualize the

total store. This idea was developed more fully near the end of the thirties and became the main focus in storefront design of the 1940s.

Keisler also promoted the use of industrial products. "Architecture is on the lookout for new materials that can be turned out in quantity by machines, such as glass, sheet metal and chemical compositions which have durability, beauty and inexpensiveness."³⁸

Entitled "Retain Store Planning" this writer called for materials which,

should be resistant to wear and easy to clean. Walls should have sanitary cove bases and equipment bases should stand up under wet-mopping or scrubbing. Easy and economical maintenance is assured by keeping surfaces and decoration simple.³⁹

Another article, "Checklist for New Construction and Modernization of Stores", called for the removal of cornices, scrollwork, carvings, and other decorative "non-essentials"; to "increase the glass area of the storefront"; to reduce steps at the entrance and to introduce ramps; to "stucco existing exterior brickwork

to smooth, non-dust gathering surfaces"; to "apply new and smooth materials to store exteriors", such as structural glass, stainless metal, or tile; and to add or replace store signs, with neon for legibility for passing motorists. ⁴⁰

A third, "Store Modernization", again reiterated the theme of modernization:

replace panel doors with doors of flush type, scrape and refinish wood floors or relay floors with wood, tile, terrazzo, or marble, cover wood floors with linoleum, remove antiquated partitions, cabinets and counters, replace old cabinets and counters with new equipment, use well designed lettering. It will do more to draw passing trade than show windows. ⁴¹

STRUCTURAL GLASS ON THE SHOPFRONT FROM 1930-1945

Structural glass was only one of many machine made products used on the shopfront of this period. Several products were used as veneers. Stainless steel as moldings and panels, ridged, waffled and smooth, adhered to the desire for shiny and clean. Porcelain enameled panels, available in a variety of colors, rivaled the use of structural glass. However, it could not provide the consistently smooth reflective surface polished glass possessed. Terra cotta, stucco, concrete, and ceramic tiles, although not necessary gleaming, could smooth the surfaces.

Other types of glass complimenting the shopfront included glass blocks, figured glass, plate glass, and Vitrolux, a translucent color fused plate glass which could be back lit and was designed by L-O-F to complement Vitrolite.

It the suggestion of the author that of these materials, structural glass was one of the most popular. Based on observation both in Philadelphia and in a variety of towns throughout the country, this material found broad use.

MODERNIZATION MOVES FORWARDThe Post-War Shopfront

PPG's Design of the Month publication (1944-56) and There's a New Trend in Store Design illustrated clearly the changes that occurred in shopfront designs as the "modernization" movement continued. Much of this shift occurred gradually, as had the shift from the turn-of-the-century design to the Art Deco, so that there are many shops that could be considered transitional in design.

By this time, the international modernists had set themselves up in America -- Walter Gropius at Harvard, Mies van der Rohe at the Armour Institute in Chicago -- and had begun to influence the education and profession of architecture. Design of the Month contained storefronts designed by an in-house architect, including E. A. Lundberg and reflects more the portfolio of one man responding to the transforming ideas connected with modernism. [Figures 25, 26, 27] There's a New Trend, on the other hand, contains designs by William Lescaze, Walter Gropius, and Eero Saarinen, all transplanted Europeans and all producing a quite different product in comparison. Yet a set of design considerations seemed to be adhered to by all.

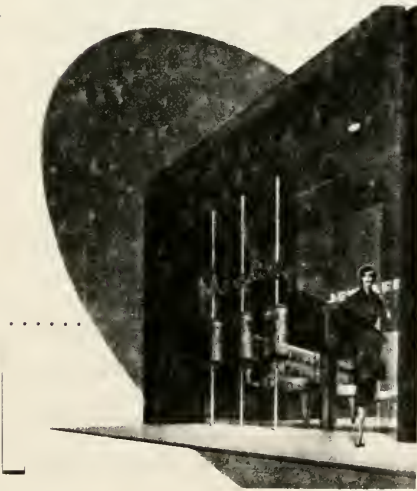
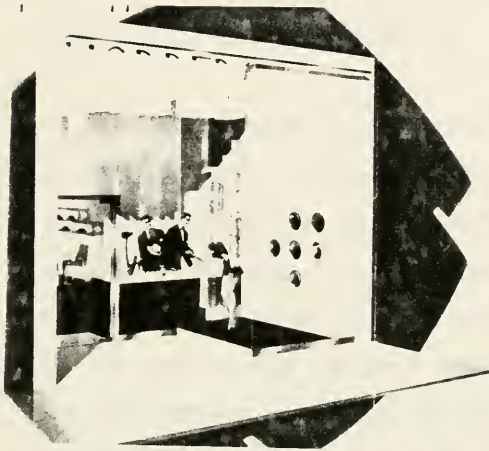


Figure 25. E. A. Lundberg's designs, "Style suggestions for man's hat store"

Figure 26. "Style suggestions for a modern jewelry store"

Figure 27. "Style suggestions for a jewelry store"

The "Open View" Storefront

Many described the store of this period as following the "open view", "open front" or "open store" concept which eliminated the display window as a separate entity.⁴² Instead, the front now contained large sheets of transparent plate glass, exposing the entire interior of the shop to the street. This concept was suggested by the designers as a method of three-dimensional advertising, in which the goods inside became part of the window display. [Figures 28, 29, 30] One of the reasons this design concept made sense was the fact that merchants were better serviced by more frequent deliveries, due to expanding roadways and trucking, and did not need to keep a large inventory of stock. What they did store, they could easily keep in basements or back rooms, affording them more space for displaying merchandize. Thus the view from the street no longer included rows of shelves and counters. Instead, goods were displayed according to new principles of merchandizing.

Several important changes occurred in the elevation

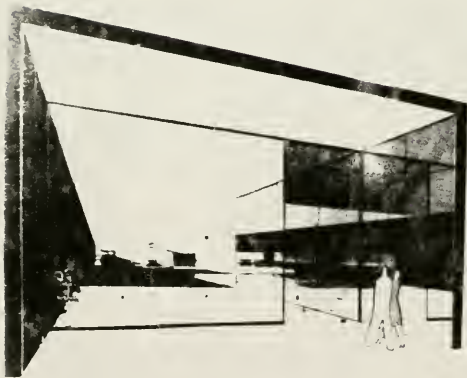


Figure 28. "Walter Gropius' concept of jewelry store

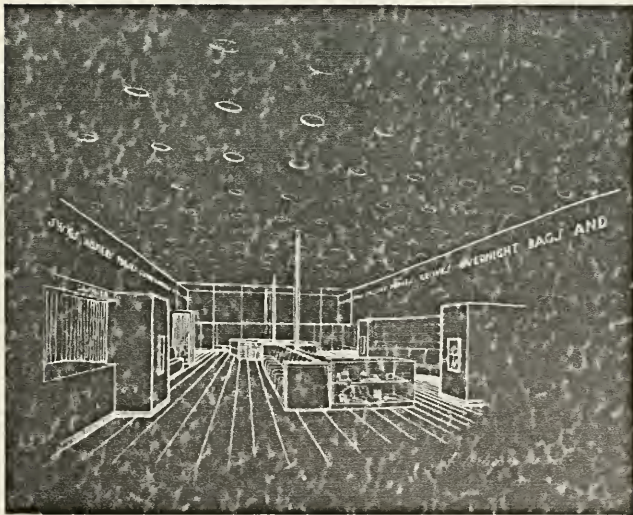


Figure 29. "Pietro Belluschi's conception of a shoe store"



Figure 30. Oscar Stonorov and Louis Kahn's conception of a men's store.

of the shopfront during this period which often had a detrimental effect on the building containing the store. These changes can be categorized in a general sense as a divorcing of the shopfront from its building, as seen by the manner in which the design of a shopfront of this period related to the building above. Many of the renderings illustrating suggested designs did not include a building above, or if they did, it is as a shadow.

Also gone was the adherence to the three divisions of the building including the 1) shopfront, topped with an architectural feature such as a cornice, 2) the upper windowed portion of the building, and 3) the definition of the top of the building found in the cornice. Rather than deal only with the ground level of the building, architects were promoting radical changes to the facades above the stores, justifying them as a unification of the building for the purpose of modernization and advertising. The result of this philosophy appeared on the street as a completely refaced building, with its ornamental features sheared off in order for the new facing to be applied, or an with extension of the shopfront up at least to the second floor or beyond, with

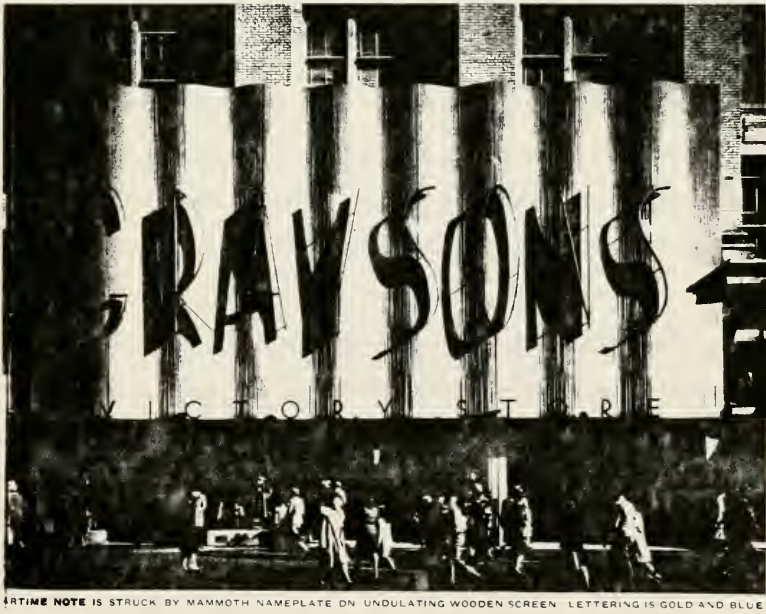


Figure 31. Huge letters advertise the name of the store

no logical terminating point. This change also allowed space for the huge letters used to advertise the store name. [Figure 31]

Another radical change occurred in the deep recess found in the plane of the whole shop. Justification for this design feature was the same used for the funneled entrance way: to draw the customer into the store. Moreover, since the whole store now operated as the display window, the loss of space by the recess didn't cost the merchant any valuable space.

If the shop did not contain such a recess, it may instead have had a cantilevered awning, either over the entranceway or over the whole front. Awnings were recommended even if they had to be attached with rods. They afforded a place to further advertise the name of the store, as well as providing protection from the weather. 43

Another design feature which significantly changed the appearance of a storefront during this period was the intentional angling of the display window, slanting it in from the top to the bottom, in an attempt to prevent glare from the glass. As the "open view" was particularly important to the merchandizing of the store,

As the period progressed, undulating shapes appeared in combination of the straight lines, defined by the

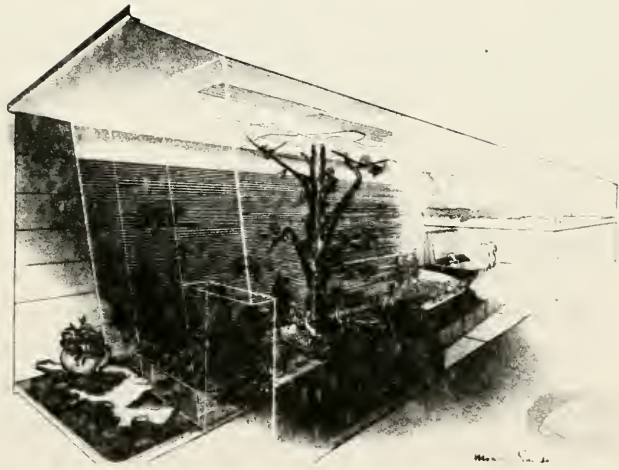


Figure 32. "Morris Saunder's conception of a florist shop"

excess glare became a problem. One wonders whether what began as a practical solution to a problem became a stylistic force of the period, so frequently was it used by designers. [Figure 32]

As the period progressed, undulating shapes appeared in combination of the straight lines, defined by designers as cloverleaves and irregular curved shapes.

Stores of today should reflect the environment of present-day civilization, with its technical and scientific improvements. Every advancement of science or art should be reflected in today's architecture. Out of this broad and very generally accepted architectural theory has come a new style as exemplified not only in building design and construction but also in automobiles, railway trains, airplanes, and furniture. This new school is also expressed in modern decoration, printing, and in almost every other form of art. The general tendency to refer to this type of design as 'streamlined' is justified by the fact that the modern school avoids art for art's sake, discards the extraneous and nonessential, and with clean swift strokes, hews as closely as possible to the line of functionalism or the creation of useable things primarily for use rather than essentially for effect or ornament. But there is a growing tendency to introduce irregular forms or 'flowing lines' as a further development toward the functional ideal of interesting display. ⁴⁴

As occurred in the early period of modernization and the post-Depression days, books and articles in architectural periodicals were published to instruct in the planning of stores. The post war years brought a period of building and expansion, creating the need for more businesses and more modern stores. It is interesting to note that most of the examples of structural glass applications contained in Section IV on the portfolio of Philadelphia stores were modernized after the end of World War II. Stylistically there was a lag in what was shown in the advertisements and as examples of good design in the periodicals, making it a bit difficult to identify the date of alteration by sight, yet this phenomenon is by no means unique to this situation.

One of the most revealing of the articles appeared in the October, 1944 issue of the Architectural Forum and was entitled "Remodeling Main Street, Niles, Michigan".

The firm of Ketchum, Gina and Sharp, Architects, ⁴⁵ will convert a block of outdated storefronts into a modern shopping center without sacrificing individuality. This postwar

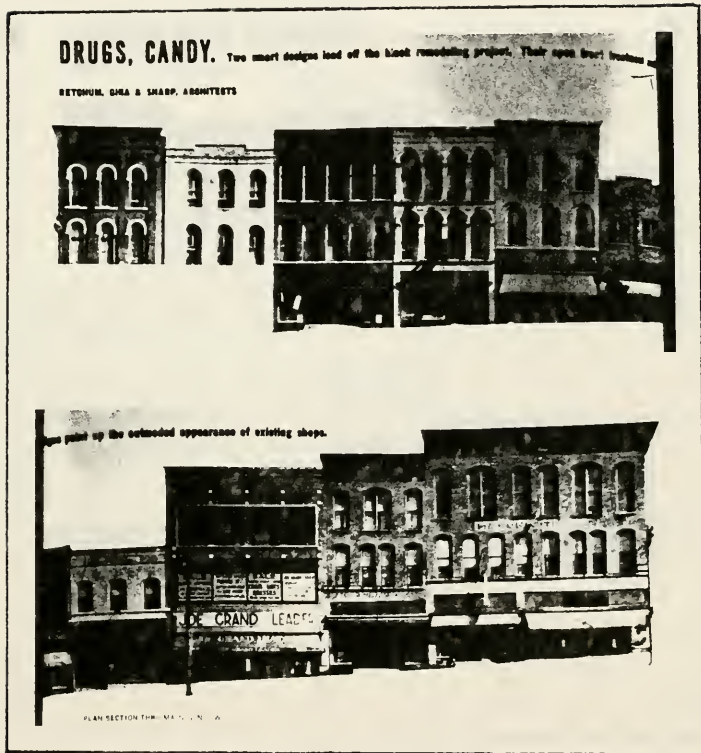


Figure 34. Niles, Michigan, before modernization



Figure 34. Niles, Michigan, proposed modernization



Figure 35. Ketchum, Gina and Sharp's proposed modernization of Niles, Michigan

project envisages the simultaneous remodeling of an entire block of outdated shopfronts under the directions of a single architectural firm as part of a still larger program for the improvement of shopping centers throughout the country.⁴⁶ [Figures 33, 34, 35]

The designers followed the current trend of designing "open fronts", to eliminate the complexity of the existing shopwindows and facades. The plans for the upper floors, had they no complete new facade, was to paint them all the same color. Niles was chosen because it represented a typical small town with a declining shopping base, due to the desire of its customers to shop in a larger town or city. Niles was also the home of Kawneer Company, a producer of metal shopfront components.⁴⁷ The merchants had been contacted and were expected to participate in the modernization program. Judging from many of the main streets in small towns across America, this modernization program had a following. The National Trust and its current Main Street Revitalization program is presently trying to undo much of its successes.

STRUCTURAL GLASS ON THE POST WAR SHOPFRONT

Structural glass remained a popular material with designers and shop owners. Again, the selection of colors expanded widely during this era, adding as many as twenty new colors. Softening in tone from the earlier days of production, the new colors fit the changing vogue. Among the designers, the material continued to receive praise for versatility, ease of cleaning, and good weathering qualities, but it also received criticism for its fragility in areas prone to blows or chipping. Designers usually specified it as facade facing, backdrop for signbands, interior walls and (still) as bathroom partitions.⁴⁸

Beginning in the 1950s, advertising began to appear for plastic panels used in shopfront application as well as for hospital operating rooms. Structural glass, although reasonably priced, undoubtedly could not compete over the long run.

NOTES TO CHAPTER II

- 1 May N. Stone, "The Plumbing Paradox," Winterthur Portfolio (Chicago: University of Chicago Press 1979, vol. 14, no. 3) p. 288.
- 2 Ibid.
- 3 Ibid. In 1864 a group of concerned citizens published The Report of the Council of Hygiene and Public Health of the Citizen's Association of New York Upon the Sanitary Conditions of the City, which made public the appalling unsanitary conditions throughout the city, and led directly to the Metropolitan Health Law of 1866.
- 4 Ibid., p. 286.
- 5 Richard Shryock, Medicine in America, (Baltimore: The Johns Hopkins Press, 1966), p. 23.
- 6 Ibid., p.23
- 7 Pittsburgh Plate Glass Company, Glass, Paints, Varnishes and Brushes: Their History, Manufacture and Use. (New York: Pittsburgh Plate Glass Company, 1923), p. 160.
- 8 Sweet's Catalogue Service, Sweet's Catalogue File, (New York: F. W. Dodge Corporation, 1929).
- 9 Pittsburgh Plate Glass Company, Glass, Paint and Varnishes and Brushes, p. 160.
- 10 Ibid.
- 11 There is a lack of documentation for this study concerning structural glass storefront application between 1906 until 1934 when advertising in the architectural periodicals commences, giving cause for speculation on these matters. In addition, this author knows of no surviving Philadelphia examples before 1935. This information is based on street surveys and building permit searches on surviving buildings conducted by the author.

- 24 Rita Caviglia, "Architecture and Storefronts of the 1930s," (Columbia University, unpublished master's thesis, 1981), pp. 24-60, for a chronology of expositions and exhibition.
- 25 Ibid.
- 26 Henry-Russell Hitchcock and Philip Johnson, The International Style (New York: W. W. Norton and Company, 1966 edition, originally published in 1932.), p. 20.
- 27 Ibid., p. 105 and 201.
- 28 Official Guide: Book of the Fair (Chicago: A Century of Progress, 1933), p. 13.
- 29 Official Guide Book: The World's Fair of 1940 in New York (New York: Rodgers, Kellogg, Stillson, Inc., 1940), p. 7.
- 30 Ibid.
- 31 "A Four Point Plan for Building Trades Recovery," Architectural Record, June 1934, p.471-473.
- 32 Libbey-Owens-Ford, advertisement, Architectural Record, October 1935, p. 8.
- 33 Ibid.
- 34 "Half Our Stores Need Remodeling," Architectural Record, September 1936, p. 136.
- 35 Frederick Keisler, Contemporary Art Applied to the Store and Its Display (New York: Brentano's, 1930), cover page,
- 36 Ibid., pp. 140-141; Between 1927 and 1928, Macy and Company, Lord and Taylor, and Sak's Fifth Avenue each had extensive displays of modern window design, much of it designed by Keisler. He considered these as expositions which conveyed the then contemporary art to the American public.
- 37 Ibid., p. 80.
- 38 Ibid., p. 31.

- 39 "Retail Store Planning," Architectural Record, July
1936, p. 53.
- 40 "Checklist For New Construction and Modernization of
Stores," Architectural Record, December 1934, pp.435-
454.
- 41 "Portfolio: Modernization of Small Shops,"
Architectural Record, December 1934. p. 155-188
- 42 These terms were used by the glass companies in
their advertising, by the architects in describing
their designs, and by others writing about the
planning of storefront design during this period.
- 43 Part of the reason for this shift, besides the
desire to be modern, comes from the concept of the
automobile and how it affected shops. Shopping
centers were developed during and after the war,
designed with a concept of developing a unified
group of stores.
- 44 Gene Burke and Howard Kober, Modern Store Design,
(Los Angeles: Institute of Product Research, 1945)
p. 8.
- 45 This firm appeared in several of the articles and
books published during this time on store design.
- 46 "Remodeling Main Street, Niles Michigan",
Architectural Forum, October 1944, pp. 100-111.
- 47 Kawneer Company advertised its storefront components
as often as PPG and L-O-F, between the 1930s and
1950s.
- 48 Gene Burke and Howard Kober, p. 49.

CHAPTER III THE MATERIAL - ITS PROMOTION AND DEMISEPROMOTION

Pigmented structural glass became an important architectural element, achieving nationwide popularity during the fifty years it was in production. Used in the modernization of "outdated", "over-ornamented" buildings, structural glass was chosen for small business establishments: shops, movie theaters or filling stations. Surviving examples are found in small towns throughout the country, and along the major commercial streets and the smaller neighborhood shopping districts in cities. What prompted the product to gain such widespread popularity became a focus of this thesis.

In viewing the surviving examples in both Philadelphia and other cities or communities visited during this period of study, vast difference appeared in the comparative quality of the design, yet some of the finest shopfronts viewed occurred in areas too small to have supported architectural professionals during the installation of the shops.

Manufacturers, architects, distributors and installers all had a significant role in the development of the product's popularity, shown by the role each played during the period structural glass was in production.

The Role of the Manufacturers

Pittsburgh Plate Glass

Pittsburgh Plate Company and Libbey-Owens-Ford, the two major producers of structural glass, planned the strategy of structural glass promotion well. Both companies offered all of the components necessary for complete shopfronts. Structural glass, however beautiful and current, may not have been the most costly component of the package; perhaps the plate glass windows offered the most profit. Therefore, the significant marketing and promotional force behind structural glass came from the promotion of the complete storefront. ¹

Pittsburgh Plate Glass (PPG) marketed tandem storefront products as early as 1912, when it developed a storefront construction system called Easy-set, that included extruded metal members designed to hold plate glass show windows. ² Carrara glass, its structural glass product, is shown in a c. 1915 Easy-set catalogue, applied as the material for the bulkhead, the section below the windows and above the sidewalk. Finding this method of marketing successful, PPG patented the storefront systems as "Pittco" in 1934.

During the post-Depression years of the 1930s, PPG took an aggressive attitude towards marketing its products, adding a glass advertising department in 1934. The department coordinated promotional materials and special campaigns, and secured patents for products.

The strength of the corporate structure was put to the test during the depression of the 1930s which it met without faltering. Neither adverse conditions nor changing markets disturbed the equanimity that has characterized the Company policies since its inception. With calm deliberation it proceeded to intensify its merchandising activities, introduced new products and services, and sold the idea of modernization of store fronts to merchants who were eager to attract the attention of the public and a larger of its patronage. These operations promoted the use of plate glass, Carrara Glass and Pennvernon,³ mirrors, metal store front construction, and paint.⁴

PPG was a significant exhibitor at the 1933 Century of Progress Exhibition held in Chicago. Out of the displays for this exhibition came storefront models which toured the country.⁵ PPG designed and built three special caravans displaying miniature models of Pittco Storefronts, containing Pittco extruded metal, Carrara

Glass, plate glass and PPG paint. The caravan toured 75,000 miles, exhibiting in fifty cities in the three year period between 1936 and 1939.⁶ During the Golden Gate International Exhibition in San Francisco, the miniatures were exhibited in the Homes and Garden Building.

At the New York World's Fair in 1939-1940, PPG constructed full size storefronts. "Full size Pittco Store Fronts lined both sides of a four hundred foot length on the Street of Tomorrow, a feature of the Fair."⁷ Many spectators viewed these exhibits, carrying away impressions which gave impetus to the growing trend toward a more general use of glass. The Street of Tomorrow was contained in the Forward March of America Building, and the miniature shopfronts were housed in the Glass Center Building.⁸

Advertising in architectural periodicals became a major focus for the promotion of Carrara Glass. Nearly every month between the early years of the 1930s through the late 1950s, when the product ceased production, each major American architectural periodical carried an advertisement. As the popularity of the product diminished, the advertising too slowed. One could trace, nearly completely, the history of Carrara glass and the history of the design of shopfronts the glass covered based on the advertising. [Figures 36 and 37]

PPG promoted Carrara and the accompanying line of storefront components through several advertising brochures published between the mid 1930s through the 1950s.⁹ Tying into the movement to "modernize", these booklets were available by the mail, offered through a coupon attached to magazine advertisement.

How Modern Store Fronts Work Profit Magic was published in 1935 and advertised in architectural periodicals throughout the year. [Figure 38] Architects or contractors could view the latest in store-front design as it appeared in situ. Regionalized examples were shown from all parts of the country. Recognizing the tenuous role of the post-Depression architect during this period, it offered, "Because it will show you how, by sending this book to many prospective store remodelers in your district, we are attempting to build up and create more store front jobs for you."¹⁰

In 1937, PPG published another booklet entitled, Producing Bigger Profits With Pittco Store Fronts, [Figure 39], advertised in the March, 1937, issue of Architectural Record. Promoting "modernization", the publication showed several before and after photographs of storefront examples. Also noted in the advertisement

HERE'S A
Complete line
OF PRODUCTS FOR
STORE FRONT
DESIGN

THE Pittsburgh Plate Glass Company maintains a nationwide system of branch offices and fully stocked warehouses, supplemented by thousands of dealers. We are therefore particularly well equipped to provide quality paint and glass products to meet the architect's specifications with utmost promptness and efficiency in any part of the country. We invite you to take advantage of this convenient source of supply.

A complete line of Pittsburgh Products of the following types is available throughout branches in leading cities:

PITTSBURGH GLASS PRODUCTS Polished Plate Glass Penetration Window Glass Carrera Structural Glass Ornamental Glass Pittsburgh Mirrors	PITTSBURGH PAINTS Sun-Proof Paint White-Blue Paint Water-Spar Enamel Water-Spar Varnish Hard-Blue Enamel
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PITTCO STORE FRONT METAL

See next page for complete specifications and for addresses of Pittsburgh Plate Glass Company branches. Be sure to visit Pittco Store Fronts creating many a million new store windows and entrances for the architect's store front designs.

PITTSBURGH
PLATE GLASS COMPANY

PITTCO
STORE FRONTS
glass metal paint

PITTCO Store Front Products—and then select perfectly matching design and construction material. In simple building store fronts. There's a complete line of store front products—all made by the same company including every material needed in store front construction. All are of high quality, dependable, unusually good looking and adaptable to original and effective treatments. They go together to form a unified, finished front—because they were originally designed to harmonize and supplement each other. In your store front work take advantage of them. And send for our new booklet—Producing Better Pictures with Pittco Store Fronts. It contains complete information on interesting photographs of many store fronts and lists which you may copy and develop for your own store. Pittsburgh Pittco Glass Company, 2305 Fairview Building, Pittsburgh, Pa.

Figure 36. Pittco storefront components

**"I've found Carrara Glass
most satisfying in my work"**

A leading American architect is in enthusiastic agreement that Carrara Glass is a versatile and adaptable medium which satisfies him in everything he gives life to their creative designs. They have found Carrara to possess all the ingredients of a good design material: structural soundness, ease of handling, low maintenance expense.

Carrara Glass is a finely machined product. It has a flat polished finish, is cut to size, free from warpage, breaks on a sharp edge. It won't crack, creep, or stain, or discolor with use. Architects are using Carrara Glass in everything from keeping the interior of a car cool to window shades. And it comes in 16 different colors and textures, including blackness.

It will be available in glass blocks and in other places in all the future. Carrara's quality features it the most useful. Write for more facts about Carrara Glass to the Pittsburgh Plate Glass Company, 1224 Chestnut Building, Pittsburgh, Pa. 15219.

STRAND

CARRARA

...the quality structural glass

 PAINTS GLASS CHEMICALS BRUSHES PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Figure 37. Carrara glass advertisement from the 1950s

A **FREE** BOOK OF MODERN STORE FRONT IDEAS FOR YOU



SEND COUPON
TODAY FOR
YOUR COPY!

THU National Housing Act, and the general trend toward the modernization of out-of-date properties, commercial as well as domestic, make this book a particularly timely one. We believe you will find it definitely valuable in your work for several reasons.

Because it will show you how, by sending this book to many prospective store remodelers in your district, we are attempting to build up and create more store-front jobs for you.

Because it contains many photographs of actual profit-making store-front installations

throughout the country which we think you will find interesting.

Because it provides accurate information concerning the qualities and proper application, with quarter-size details of the store-front products manufactured by the Pittsburgh Plate Glass Company.

And because of the original ideas for store-front design and decoration, which it is possible this book may inspire, and you elaborate, for use in your own store-front remodeling work.

The supply of books is limited. So sign and mail the coupon now for your copy.

Ceramic Structural Glass Pittco Store Front Metal Pittsburgh Mirrors	PITTCO STORE FRONTS <i>glass metal panel</i> BROCHURE PITTSBURGH PLATE GLASS COMPANY	Pittsburgh Paint Products Polished Plate Glass Tapestry Glass	Pittsburgh Plate Glass Company, 2290 Grant Bldg., Pittsburgh, Pa. Please send me without obligation, your new book entitled "How Modern Store Fronts Work Profit Magic." Name _____ Address _____ City _____ State _____
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Figure 38. How Store Fronts Work Profit Magic

Send for this FREE Book of
MODERN STORE FRONT IDEAS

Producing Bigger Profits
WITH PITTCO STORE FRONTS

PITTCO
 STORE FRONTS

We believe this new book... will prove valuable to you. It contains many "before" and "after" photographs of actual profit-making store front installations throughout the country which we know will be of interest. It provides accurate information concerning the qualities and possibilities of the complete lined store front products manufactured by the Pittsburgh Plate Glass Company. It shows you how we are attempting to create more store front jobs for you. And it may inspire some original ideas in storefront design or installation which you will be able to fabricate and use in your own store front remodeling work. Sign and seal the coupon below for your free copy. Be sure to use the Pittco Store Front Card, now on a nation wide tour. Contact our local branch for information as to when it will visit your territory.

PITTCO
 STORE FRONTS

See Sample for complete specifications and for addresses of Pittsburgh Plate Glass Company branches.

PITTCO
 PLATE GLASS COMPANY
 MAKE THE CHOICE TODAY

BACK to Pittsburgh Glass Products and Pittsburgh Paints stands more than half a century of glass and paint-making. Half a century of experience in field and factory, of vital research and development work of wide acquaintance with architectural and building requirements. We invite you to call upon us for any information you may desire in connection with the use of paint and glass.

A complete line of Pittsburgh Products of the following types is available throughout the nation by leading cities.

PITTSBURGH GLASS PRODUCTS

Polished Plate Glass
 Penosperm Window Glass
 Carrara Structural Glass
 Ornamental Glass
 Pittsburgh Mirrors

PITTSBURGH PAINTS

Sun-Proof Paint
 Whitehide Paint
 Waterproof Enamel
 Waterspar Varnish
 Florhide Enamel

PITTCO STORE FRONT METAL

Figure 39. Producing Bigger Profits with Pittco Storefronts

for the booklet was an announcement of the traveling caravan of miniature storefronts.

A free book called How to Get More Business was available in 1939, again illustrating the "profitable" use of Pittco products. The idea that modern, attractive stores drew the attention to the business inside was certainly not new, but through these booklets, PPG attempted to promote the importance of new, modern and beautiful stores.

Beginning in 1945, the company began publishing a monthly flyer entitled Design of the Month which was available through subscription and intended for the distribution center, wholesale shop, or architect.¹¹ [Figures 25, 26, 27] The publication of the pamphlet spanned over ten years, illustrating the change in shopfront design during that time.¹² A color publication, with renderings of shop fronts done by staff architects and later by E. A. Lundberg, A.I.A., it illustrated the use of PPG products, and was expanded in the 1950s to include Spectrum Metal, channel metal letters, and color schemes according to "Pittsburgh Color Dynamics principles".

There's a New Trend in Store Design, another booklet available by coupon, was published c. 1945, and included forty-three pages of shopfronts, each designed by well-

known contemporary architects. According to the advertisement of the April 1945, Pencil Points, PPG advertised in twenty-one different magazines, "urging merchants to plan now for postwar modernization, alterations, and new buildings -- with the help of the architect." [Figures 28, 29, 30]

In addition to advertisements in architectural periodicals, the Sweet's Catalogues Files contained information on Carrara glass in sections marked storefronts, as well as in sections on glass or structural glass. PPG advertised in the catalogue from the first edition of 1906 up to the time of the termination of the product.¹³

Libbey-Owens-Ford

When Libbey-Owens-Ford (L-O-F) purchased the Vitrolite Company in 1935, it gained an aggressive company which had several marketing and promotional strategies in place. Advertising in architectural periodicals took place on a monthly basis, with full page ads, picturing storefronts, bathrooms and kitchens. Vitrolite bathrooms were exhibited at the Century of Progress Exhibition in Chicago during 1933 and 1934. By

clipping a coupon in an advertisement, one could send for brochures on Vitrolite bathrooms and kitchens, construction details and specifications, or for a record of the displays at A Century of Progress Exhibition. The company advertised in Sweet's Catalogue Files in 1922 through 1929.

The Vitrolite Company had authorized dealers across the United States in thirty-two cities and also in Havana, Calgary, Mexico City, Johannesburg, Osaka, San Juan, Melbourne and Colombia.¹⁴ Installation of Vitrolite could be done by representatives in these locations, and the company urged that these representatives be consulted for specifications. In addition the company had an Art Department which would prepare color sketches for architects suggesting "Vitrolite arrangements and color schemes, without obligation."¹⁵ The Engineering Department would consult on construction specifications, including methods of fastening, special shaping and finishing, and would prepare sketches of details and shop drawings.

L-O-F used the Vitrolite logo for at least two years after purchasing the company, and continued to use the product name until it ceased production in the late 1950s. The merger was evidently an advantageous one, as the reputation of the Vitrolite Company appeared good.

The Vitrolite Company, manufacturer of structural glass at Parkersburg, West Virginia, was purchased during 1935. The Vitrolite Company has long been favorably known as the manufacturer of Vitrolite,.....¹⁶.

L-O-F also manufactured tandem storefront components, including plate glass, Extrudalite, the company's patented extruded metal moldings, and Vitrolux, a translucent glass with a vitreous color fire-fused on the back.¹⁷ As with the PPG products, L-O-F advertised these products as complete storefronts, composed of separate elements.

Perhaps the most significant of the L-O-F promotions was the "Modernize Main Street" competition held in 1935. Without specifying that structural glass be used in the final designs, a large majority of architects included it in their entries. When the winning designs were published in the October issues of both Architectural Record and Pencil Points, all included Vitrolite. As the designs submitted reflected the most in "modern" contemporary shopfronts, comparable to

European counterparts, L-O-F was on the cutting edge of architectural innovation.

Shortly after the competition, L-O-F published 52 Ways to Modernize Your Storefront, which included renderings in color of competition entries and many of the finalists,

to be distributed to logical prospects for modernization. They are, of course, clearly described as general suggestions only and the store operator or real estate owner is urged emphatically to retain his own architect for working out his own specifications. It is significant to note how generously the various kinds of L-O-F flat and structural glass are specified not only in the competition designs but wherever modernization is now being undertaken.¹⁸ [Figures 19, 21, 23]

L-O-F also made product literature and color charts available through mail order. In 1937 a booklet entitled I Want the Smartest Store on the Street included renderings of shopfronts and color samples. [Figures 40, 41, 42] Vitrolite Store Fronts and Building Exteriors, c. 1936, gave a description of the product, specifications for installation, suggestions for signage, illustrations of the type of finishes, designs for



HATS the way live, sales-minded retailers are thinking, these days. And that's the way modern architects and contractors are answering their demands—with Vitrolite, the colorful structural glass.

A handsome, well-designed store front of Vitrolite is the very essence of modern merchandising, because it serves as a smart, modern frame for your show windows, a rich display of your merchandise, with a radiant beauty that attracts and holds patronage in ever-increasing volume. A positive profit-maker from the very first day it's installed.

Vitrolite withstands all weather in all climates. It does

not absorb odors. It will not check, craze, or grow dull with age. A few strokes with a damp cloth are all Vitrolite requires to maintain its lustrous newness.

Best of all, a Vitrolite store front more than pays for itself—by instantly increasing property value—by its ease and economy of installation—and low upkeep cost.

Have the smartest store on the street by modernizing with colorful Vitrolite. Put on a front to be proud of—one that does justice to your store and its reputation. The crowds follow where Vitrolite shows the way. Successful stores from coast to coast are modernizing this better, more colorful way.

VITROLITE

A LIBBEY • OWENS • FORD PRODUCT

Figure 40. "I want the Smartest Store on the Street."



This simple scheme combining emerald agate and black Vitrolite, the store's name done in colored opaque glass inlaid into the Vitrolite, is ideal for the modern sanitary food store.

Figure 41. "United Food Store"



This modern market front radiates cleanliness and friendliness in its attractive combination of ivory, golden agate, and royal blue agate Vitrolite. The red letters are of inlaid colored glass.

Figure 42. A modern market featuring ivory, golden agate, and royal blue agate Vitrolite. The sign is inlaid red glass.

retail stores, movie theaters and service stations, and a section of photographs of actual installations. To "help create new prospects and get the jump on competition" L-O-F offered a slide-view package which included a slide-viewer and thirty-six color slides of "outstanding" L-O-F storefront installations. For \$50.00 one received eleven of the slides immediately, and the others came on a monthly basis until the set was complete. This item was aimed at architects, installers, and distributors. ¹⁹

[Figure 43]

L-O-F exhibited structural glass at the 1939 Golden Gate International Exposition.

Sweet's Catalogue File contained product information and specifications throughout the years of its production, listing the product under headings of structural glass, store fronts and glass.

The Role of the Distribution Center

In 1895 executives of PPG decided to acquire distribution centers in the cities which were their major markets, for the purpose of selling their own products. The company continued to sell to the wholesale market as

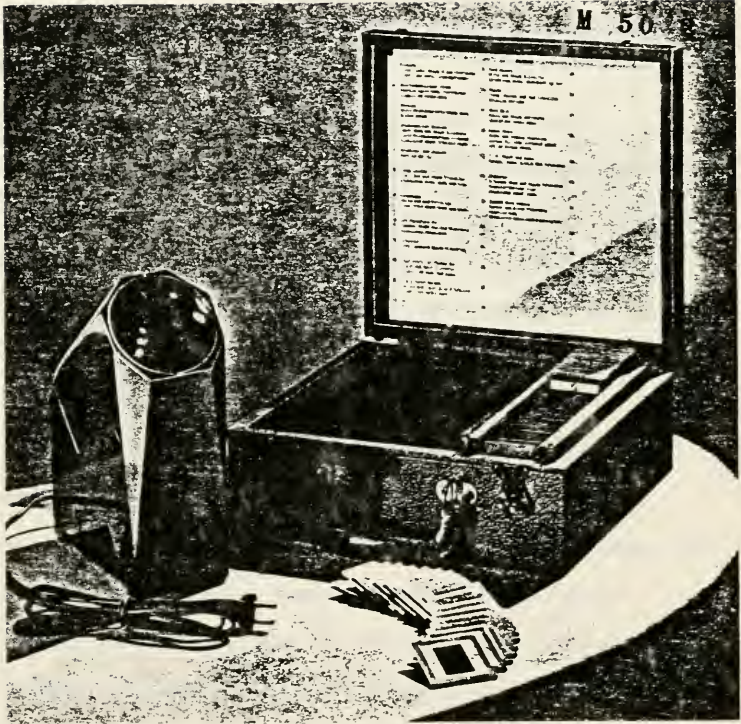


Figure 43. The Libbey-Owens-Ford Slide View Service

well.²⁰ Each center had a estimation department, a contract department, and glass installers, as well as staff members who included a plan surveyor and sales representatives.

It seems that L-O-F inherited the Vitrolite distribution centers and the authorized installers and representatives. Product literature from L-O-F published in 1937 contained a section called "Specifications for Vitrolite Structural Glass," which served as a guide to preparing contracts for the installation of the glass. Advertising also indicates that L-O-F had an Art Department and Engineering Department, perhaps also inherited.²¹

This distribution system had several advantages for the companies, including added profit, continuous promotion, insight into the demands of the market, and control over the installation of their products, and as suggested earlier, the sale of complete storefronts.

Independent companies sold both PPG and L-O-F products, competing with the manufacturers. During the most prolific years, however, it seems there was enough business to go around.²²

The Role of the Architect

An abundance of well designed shopfronts utilizing structural glass suggests that the architects, either as company staff hired to promote company products or in private practice, contributed significantly to the the good design of small shops installing structural glass across the country. Those applications without architectural involvement are usually apparent, identifiable when the glass simply appears on the shopfront without much adherence to principles of form or placement. Examples to illustrate this point will follow in the Philadelphia Portfolio section.

At the time structural glass began to be applied as a storefront material, the Depression had begun. Architects found themselves under- and unemployed as construction projects ceased and opulence in architectural projects became a thing of the past. In an article in the January 1932 issue of Pencil Points entitled, "How to Find a Job During the Depression" R. B. Wills suggests securing a position with a retail chain designing store fronts.²³

Both companies recommended that businessmen planning a store modernization consult with a professional architect and provided services through their engineering departments and with PPG, the estimating departments and contracting department. In their art departments both PPG and L-O-F employed architects. For the price of the shopfront components, a small retailer could take advantage of the art department staff for design advice and for assistance with color selection. Unfortunately, neither company has retained records of employees during the 1930s or 1940s, or the duration of the departments. One architect, Bruce Goff, was employed by L-O-F.²⁴ Responsible for shopfront designs in the company's promotional brochures and for magazine advertisements, he most likely produced designs commissioned by small retailers purchasing products for the store front modernization.²⁵ [Figures 44 and 45]

Pittsburgh Plate Glass commissioned or had on staff an architect, E. A. Lundberg, during the time Design of the Month was published, as he signed many of the designs. [Figure 25, 26, 27]) In addition, Walter D. Teague designed several of the model shopfronts traveling in the PPG caravan.²⁶

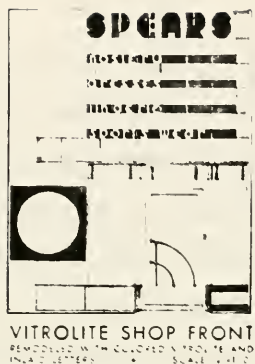


Figure 44. "Vitrolite Shop Front", design by Bruce Goff, architect.

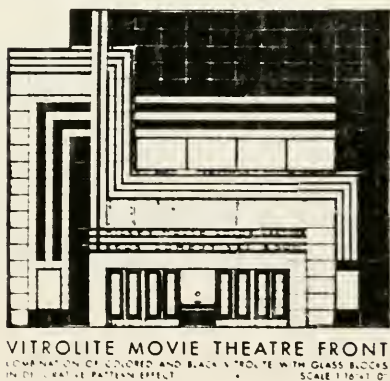


Figure 45. "Vitrolite Movie Theatre Front", design by Bruce Goff, architect.

PPG's 1945 publication, There's a New Trend in Store Design, which advertising for architectural periodical was abstracted, included forty designs by twenty-four "outstanding" American architects.²⁷ Promoting both the company product as well as design by contemporary architects, the list included such "Americans" as Oscar Stonorof, Eero Saarinen, Walter Gropius, William Lacaze, Pietro Belluschi, and also included Holmes Perkins, Louis Kahn, Clarence Thalheimer and David Weitz; and Skidmore, Owings, and Merrill.

The Role of the Installers

Installation of structural glass was performed by glaziers, the skill relating to other aspects of their trade, such as the hanging of mirrors.²⁸

When structural glass reached its height of popularity, contractors and glaziers independent of the glass companies' scrutiny could install facades without following the recommended applications, perhaps leading to the more haphazard appearance of shopfront installations now surviving as a relics.²⁹ [Figure 48]



Figure 46. Haphazard installation on Woodland Avenue

THE DEMISE

The production of pigmented structural glass ended in the early 1960s for a variety of reasons. From the perspective of the manufacturers, distributors and installers, the failure of structural glass was due to economic and cyclical issue. Posing the question of its demise to representatives of each of group resulted in different answers.³⁰

All agreed that "it went out of style".³¹ The desire for maintaining a contemporary or fashionable image did not end with the period covered in this study. This desire is witnessed by continued, almost cyclical rehabilitation of business districts. American and European commercial and retail architecture has traditionally been one of the most accurate barometers of taste and change in style. Structural glass emphatically represented a distinct period in time, one which like its predecessors is now outdated and largely forgotten.

American society had come to expect the continued renewal of consumable products - cars, appliances, houses - beginning in the economically prosperous times of the post war years. Concurrent with this demand was the new availability of less expensive materials for use in

and bent in the factories, installers were faced with an inflexible material. Once the sheets arrived ready for application, site adjustment for mismeasurement was difficult, at times impossible, a factor which could and often did increase costs³⁵ It is not suprising to find by the mid-fifties the less labor- and cost-intensive materials gaining in popularity and eventually superceding structural glass.

As with other building products, such as terra cotta, the life of structural glass depended on its ability to last. It failed as material, fell out of favor with designers, posed financial considerations concerning installation, and represented an age of architectural revolution of the past. All contributed to the demise.

NOTES TO CHAPTER III

- 1 Conversation with Samuel Y. Harris, speculating about the real reasons for the popularity of structural glass, April 24, 1985.
- 2 Pittsburgh Plate Glass, Glass Manual, (n.p., c. 1945), Section A-2, p. 14.
- 3 Pennvernon, a PPG product, consists of flat drawn sheet window glass.
- 4 Pittsburgh Plate Glass, Glass Manual, Section A-2, p. 12.
- 5 "Store Front Caravan", Architectural Forum, (November 1936) p. 42; Pittsburgh Plate Glass Company, advertisement, Pencil Points, January 1936, p. 54.
- 6 Pittsburgh Plate Glass, Glass Manual, Section A-2, p. 15.
- 7 Ibid., Section A-2, p. 17.
- 8 Ibid.
- 9 Ibid.
- 10 PPG disposed of the balance of its archive, including structural glass product material. Research for the records of product material by this author is largely based on architectural periodical advertising, with the supplementation of product literature found in other archives or libraries. No copies of How Modern Store Fronts Work Profit Magic, Producing Bigger Profits With Pittco Store Fronts or How To Get More Business became available during this study.
- 11 This publication corresponded to the Modernize Main Street Competition co-sponsored by Libbey-Owens-Ford.
- 12 An oversized publication, measuring 11" x 20 1/2", it was folded for mailing to 8 1/2" x 11". Opened to its full size, it fit in a cloth binder entitled

- 12 An oversized publication, measuring 11" x 20 1/2", it was folded for mailing to 8 1/2" x 11". Opened to its full size, it fit in a cloth binder entitled "Design of the Month Portfolio". A copy of "Design of the Month Portfolio" is shelved at the Cornell University Fine Arts Library; containing an incomplete collection, beginning with September 1944 and ending with June, 1957. Vol. XX, no. 6 (twentieth year, sixth issue), dated June, 1957, indicates the publication began in 1937.
- 13 I reviewed Sweet's Catalogue Files for 1906, 1909, 1917, 1922, 1933, 1939, and 1959. PPG did not advertise in the 1922 edition.
- 14 Vitrolite Company, advertisement, American Architect, January, 1934, pp. 90-91
- 15 Ibid.
- 16 Annual Report, Libbey-Owens-Ford, (1935), p. 5.
- 17 Vitrolux, as a transparent colored glass, could be backlit, giving a quality of colored illumination. Research by the author into other manufacturers indicates that this product may have been unique to L-O-F.
- 18 Libbey-Owens-Ford, advertisement, Architectural Record, November, 1935, p. 20.
- 19 Libbey-Owens-Ford, advertisement, Architectural Forum, June 1939, p. 121.
- 20 Pittsburgh Plate Glass Company, Glass Manual, Section A-2 p. 20. By 1937 seventy-four branches were in operation, and by 1945 the markets east of the Rocky Mountains were serviced by seventy-six warehouses and seventy-seven company-owned stores, distributing glass, paint, brushes and accessories. Products on the West Coast were distributed by W. P. Fuller and Company.
- 21 Libbey-Owens-Ford, Vitrolite in Architecture and Decoration, (Toledo: Libbey-Owens-Ford Glass Company, 1937), p. 3.

- 22 Conversation with Edgar Perilstein, a former owner of William Perilstein Glass Company, active with fourteen branches in the east coast area, distributing glass products, March 21, 1985. This company carried both PPG and L-O-F products, as well as two foreign makes of structural glass.
- 23 R. B. Wills, "How To Find a Job During a Depression", Pencil Points, (January, 1932), p.
- 24 David G. De Long, The Architecture of Bruce Goff, (New York: Garland Publishing, Inc.), vol.2, p. 516. Goff headed the L-O-F Vitrolite design team, from 1936 to 1937, first in Chicago, then in the Toledo office.
- 25 Ibid., vol 1, p. 125. Goff's designs include the Brent's storefront, a bathroom for Mr. and Mrs. D. H. Goodwillie, Toledo, OH; Morris Plan, bank front and stores, Bishop Shoes, and Talbot Clothing, as well as the "Vitrolite for the Modern Theatre", "Gas and Service Station", "Vitrolite Shop Front", Eight Story Office Building.
- 26 "Store Front Caravan", Architectural Forum, (November, 1936), p. 42.
- 27 Pittsburgh Plate Glass, There's a New Trend in Store Design (Pittsburgh: The Pittsburgh Plate Glass Company, 1945), p. 2.
- 28 Conversation with Vincent Vassa, principal in Kracavitz Company, a glass distribution business operating throughout the period of structural glass installation, April 5, 1984.
- 29 Ibid.
- 30 Conversations with Edgar Perilstein; Vincent Vassa; William McConnell, Pittsburgh Plate Glass Company, October, 19, 1984.
- 31 Ibid., each made the same quote.
- 32 Katheryn B. Hiefinger, ed. Design Since 1945, exhibition catalogue, Philadelphia Museum of Art, (Great Britain: Balding plus Mansell, Wisvech, Cambs, 1984), p. xiv.

- 33 Libbey-Owens-Ford, "Vitrolite Glass Facing", (n.p., 1947) p. 3.
- 34 Conversation with Vincent Vassa.
- 35 Conversation with Samuel Y. Harris, speculating on the demise of structural glass; confirmed in a conversation with Vincent Vassa.

CHAPTER IV PORTFOLIO OF PHILADELPHIA SHOPFRONTS

Pigmented structural glass gained widespread popularity throughout Philadelphia, witnessed by surviving shopfronts or remnants of them along Center City commercial streets, and on almost every neighborhood shopping district in the city.

This portfolio represents many of the best remaining examples. Generally these shopfronts can be characterized as small business, such as jewelry stores, optical shops, clothing stores, shoe stores, drug stores and the like. More are found in the smaller commercial districts of the city, those which consist of two to four blocks of stores supporting the majority of the retailing needs of the surrounding community.

To determine the date of shopfront installation, building permits were researched through the City of Philadelphia Records. When properly submitted, the permits include such pertinent information as date and type of building activity, cost, use of building, owner, and the involvement of architects and contractors.

For this particular study, the permits did not always present reliable information. The city records, although readily available, do contain filing

inaccuracies, oftentimes preventing the review of the actual permit. More critical to this study, however, was the lack of definitive information describing the alteration of a storefront, and the frequency of storefront alterations on many of the examples researched. Both contributed inaccurate dates for structural glass installation. Frequently, no permit was issued for the work.

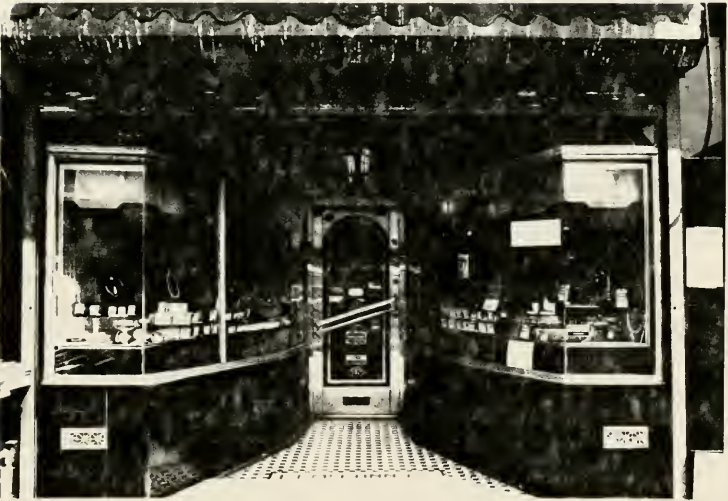
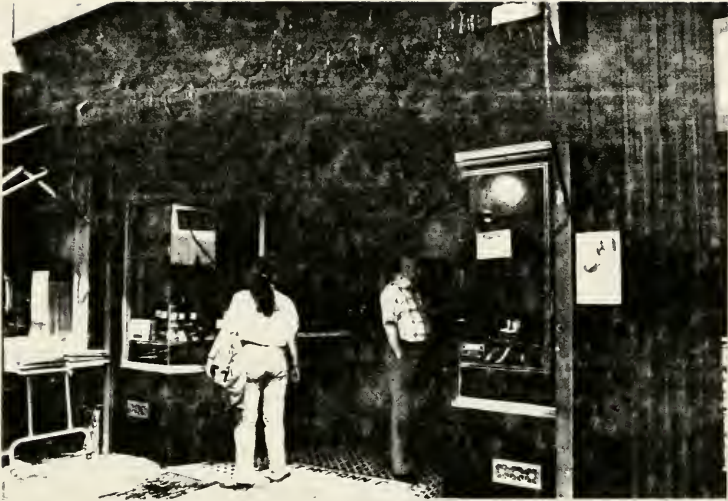
Many examples contained in this portfolio remain unaltered, the shops still in the hands of the owners responsible for the installed. On many occasion shop owners were interviewed, therefore verifying information found in the public records. These conversations had added benefits. Mr. Daub of Daub Brothers Jewelers showed me plans for the design and installation his store drawn by Pittsburgh Plate Glass, confirming the involvement of the the local the distribution centers. [Figures 57 and 58] Mr. Snyder of Stenton Drug provided the name of the architectural firm responsible for the design as well as the date of construction. The corresponding permit did not specify storefront alteration as part of the described work, or did it list architectural involvement.

In the situations where no documentation presented accurate dates for installation of structural glass for particular shopfronts, a circa date has been given based on my familiarity with the material and of the growth patterns of the city, specifically the neighborhood districts.

Theodore A. Sloan, Jeweler	1935
5549 North 5th Street	Figures
	47 and 48,

During my search for Philadelphia examples, I found no earlier installation than Theodore A. Sloan, Jeweler. This application represents the use of structural glass in a traditional shopfront. The glass appears in the bulkhead area, and as a surround to the shopfront. The signband has been a subsequent change to the original installation.

The building permit was issued to J. J. McCann of McCann and Sloan, Jewelers, in 1935, "to erect a new bulk with black glass base."¹ Of particular note, not visible because of the burglar screen, but where the cove of the ceiling begins to arch, near the top of the display windows, sandblasted patterns of flowers appear. Also adding interest and integrity to this store are the backlit etched, frosted glass panels hang at the top of the display windows.



Figures 47. and 48. Theodore A. Sloan, Jeweler

Miller's	1937
4861 North Fifth Street	Figures
	49 and 50

The Vitrolite Company produced variegated colors, resembling marble, as part of its product line of structural glass. Also available as stock items were factory sandblasted sheets suggesting a fluted or a striped effect. Libbey-Owens-Ford continued these varieties for a time after they acquired the Vitrolite Company in 1935, which made them available to Sylvester Lowery for installation on the shopfront of this building in 1937.² Appendix D presents a chronology of the appearance of the specialized varieties.

The green variegated Vitrolite appears above and below the windows, with the sandblasted pieces combined, one on top of another, to form fluted patterns framing the vertical sides of the windows. Black Vitrolite provides a small band at the bottom of the bulkhead, and curved, it surrounds the doorway.

A true "corner store", away from a commercial area, Miller's demonstrates a very early application of the glass, and the technology available to produce some of the more unusual varieties of structural glass.

Based on a 1937 permit for the change of a new bulk window opening, and the colors and varieties, this date accurate.³



Figure 49. Miller's Corner Store

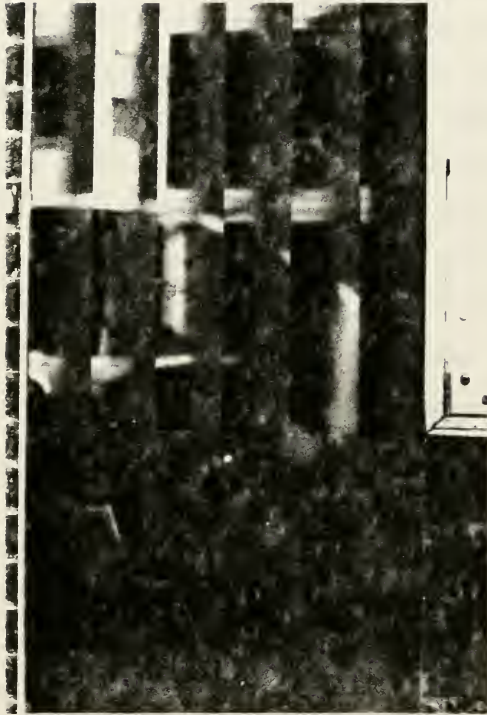


Figure 50. Detail of both the green variegated and fluted sandblasted available with Vitrolite Glass

Stenton Drug	1940
530 Vernon Road	Figures
	51 and 52

What original materials remaining indicate that this design for a drug store followed the mandates of modern shopfront design of the 1940s, including the smooth shining surface of the white Carrara glass, streamlined across the front, emphasizing the low height of the building. The neon signband, incorporating the name of the business into the facade, is delineated with bands of red, and when filled with light serves to advertise the store. The slanted "S" of "Stenton" gives the word motion, as the building, to which it is attached, curves away to nothing.

A continuous band of windows, the effect aided by the use of thin metal molding strips, is interrupted by a curved entrance. Utilizing the technology of bent glass the architects specified it for appears on both the windows and the structural glass below. The bulkhead area contains both white structural glass as well as blue enameled panels, which appear original to the installation.

Thalheimer and Weitz designed the storefront, the components were provided by Pittsburgh Plate Glass and the installation was completed by Michael McCluskey, contractor, according to information provided to the author by Mr. Arnold Snyder, although the building permit listed no such information.⁴

Unfortunately, much of the early fabric no longer exists, and the roll down metal burglar screens detract from the pattern of the windows.

Stenton Drug is located near the Stenton railroad station, on a major street in the Mount Airy section of the city. Few other commercial establishments exist near or around this store.



Figure 51. Stenton Drug Store, looking east

Figure 52. Stenton Drug Store, looking west

Milady/ Paris shops
940 Market Street

1940

In 1940 three stories from the top of the building at 940 Market Street were removed, and the entire front was clad with ivory structural glass.⁵ Although the building permit gives no indication of the type of store, it appears from the name "Milady" patterned in the terrazzo floor that the shop sold ladies' apparel.

The enormous pieces of curved plate glass framed by smaller pieces of structural glass make this shop especially interesting from a technological viewpoint. The plate glass fastened by small metal clips helps give the impression that the glass is continuous from the outside edge all the way through the recess and out the other side. An more recent alteration of the doorway removes the continuity of this huge sweep of glass.

Unfortunately, no early photographs were located during this study to shed light on the original store in its entirety.

Located on Market Street across from the Gallery shopping center, long a viable shopping district, the fate of this shopfront is predestined. Further improvements of Market Street will undoubtedly remove all the buildings on this side of the street.



Figure 53. and 54. 940 Market Street

Daub Brothers Jewelers	1941
5706 North Fifth Street	Figures
	55-58

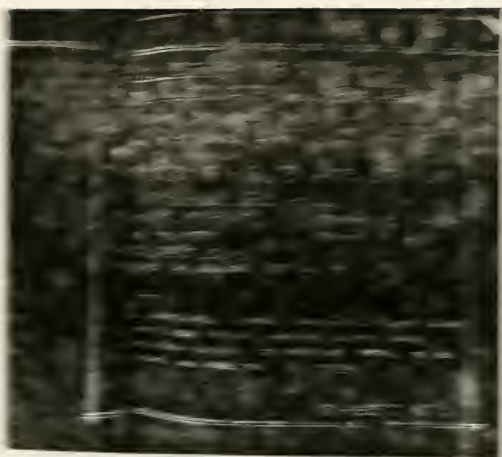
Immediately prior to World War II, the Daub Brothers installed a storefront of marble, gray suede finished Carrara glass, bronze Extrudalite mouldings, Herculite door and plate glass windows, all Pittsburgh Plate Glass products.

Based on designs contributed by the owners, Mr. William D. Baker, contractor, drew plans for a new shopfront. When taken to Pittsburgh Plate Glass Company, the plans were returned delineating the shopfront with specifications and details for the installation of the shopfront components.⁶ [Figure 56] The plans specified that installation of materials other than Carrara glass, window glass and bronze molding were to be contracted by others. [Figure 55]

Combining rich materials, such as the marble, structural glass with matte finish and bronze moldings and lettering fit the description given to the elegant modern shop of Paris exhibited at the 1925 Exposition Internationale des Arts Decoratifs et Industriels

Modernes. Structural glass in this application complemented the other matte finishes and provided a monolithic surface from which to mount the letters.

North Fifth Street between the 5400 block and the 5700 block is the commercial district of the Olney section of the city, established in the first fifteen years of the twentieth century. Many other examples of structural glass appear in this district, including Theodore Sloan Jewlery. [Figures 47 and 48]



2. The second part outlines the various methods used to collect and analyze financial data, including direct observation, interviews, and the use of statistical models. It highlights the challenges associated with data collection in different contexts and provides recommendations for improving data quality.

3. The third part focuses on the interpretation of results and the development of policy recommendations based on the findings. It discusses the role of stakeholders in the decision-making process and the importance of communicating results effectively to relevant audiences.

4. Finally, the document concludes by summarizing the key points discussed throughout the report and offering suggestions for future research and practice. It stresses the ongoing nature of the work and the need for continued collaboration and innovation.

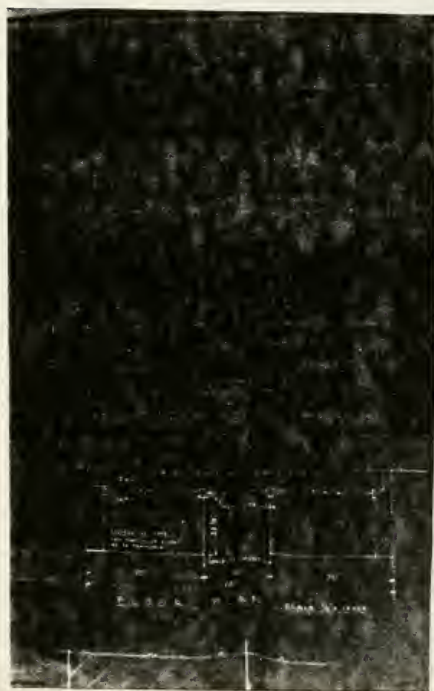


Figure 57. Elevation of Daub Brothers Jewelers

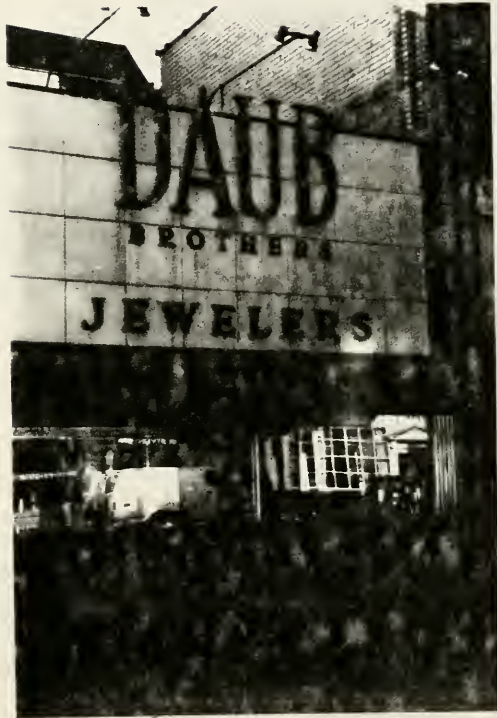


Figure 58. Daub Brothers Jewelers

Wallace Flowers	1946
1541 South Eighth Street	Figures
	61-63

Wallace Flowers represents a forcefully designed application for a corner flower shop. A circle, triangle and rectangle slice into the building above the window level, providing some deviation to a smooth streamlined face. Other features, such as the slanted window beneath the "Wallace" name follow recommended window shapes for the post war period.

The building permit, issued in October 1946, lists only repair to the front wall to comply with a condemnation notice, at the cost of \$300.00.⁷ More recent permits yield no further information; therefore, no documentation surfaced to reveal the specific date of this installation or a designer. I hold the opinion that this shopfront was designed either by one of the companies providing design services, or by a local architect, as it shows creative use of shopfront moldings, curved glass, slanted windows and structural glass.

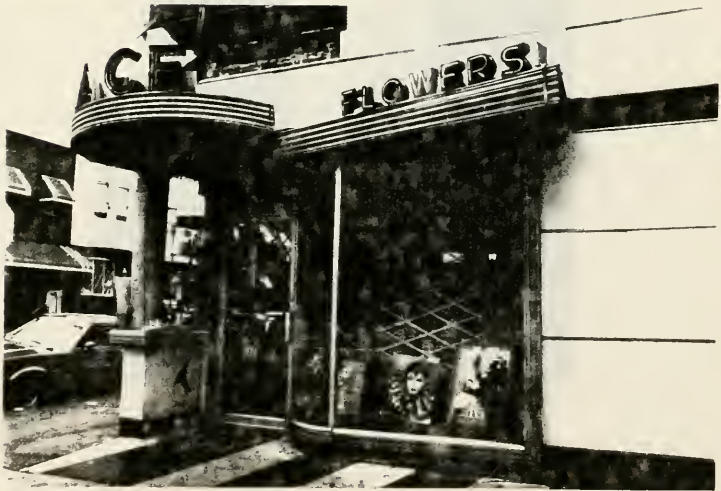
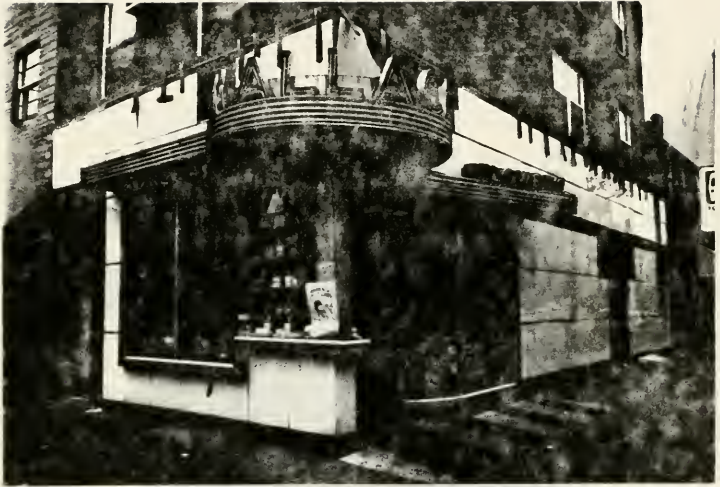


Figure 59. Wallace Flowers, looking east.

Figure 60. Wallace Flowers, looking west

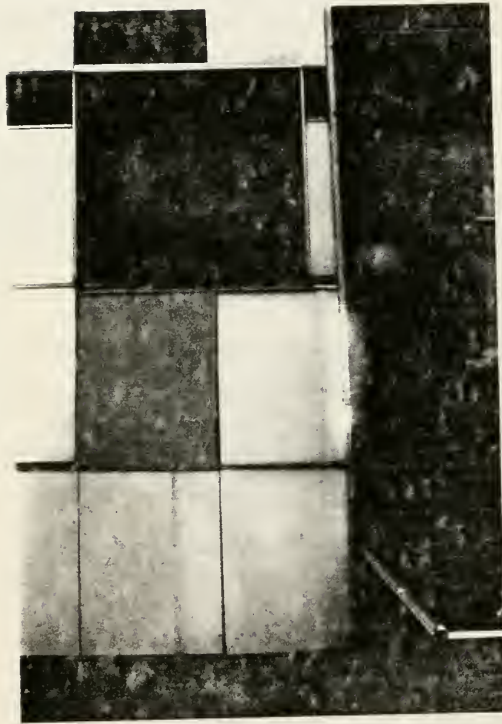


Figure 61. Detail of deterioration in this installation

Eye Center Building

1946

11 North Sixtieth Street

Figures

62 and 63

Dr. Samuel Bocaster had this storefront installed in 1946.⁸ A simple front of ivory structural glass, the entrance curves in to a short recess, which contains small display windows. No remnants appear above the windows to indicate that a signband existed. Based on the motif, the painted lettering at opposite sides of the window appears original.

This installation represents the type of complete shopfront designed by company architects and installed through the distributor, indicated by the extruded molding pieces which complement the curves and by the bent windows and bulkheads, an item which had to be custom ordered.

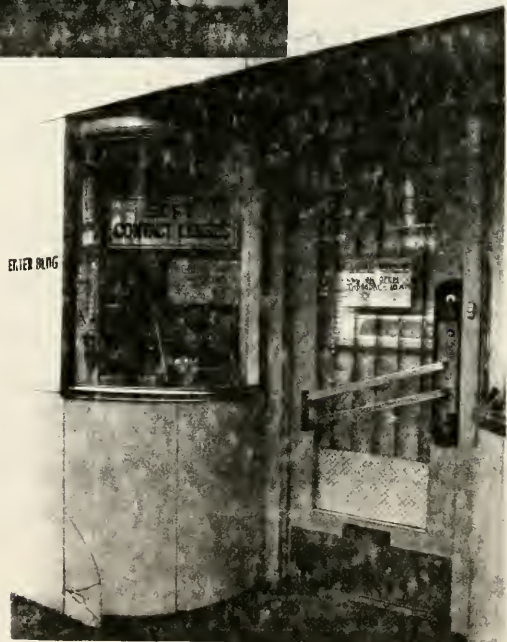


Figure 62. The Eye Center Building

Figure 63. Detail of the entrance, the Eye Center Building

Jewelry Store

1950

29 South Eleventh Street

Figure 64

In August of 1950, R. Huberman took out a building permit for the installation of a new storefront, including "bulks, windows, terrazo floor at entrance", with the estimated cost of \$3.500.⁹

Although presently a fur salon, the height and size of the windows were typical of the jewelry stores of the postwar period. Blue structural glass appears, but remains only as a surround for the store opening, although it may have been applied to the area of the signband.

This store was chosen as an example of a postwar installation using a more geometric shape, and with a floating display window, as suggested by E. A. Lundberg in the Pittsburgh Plate Glass Company publication, Design of the Month. The colors and pattern of the mosaic tiles applied in the bulkhead point to the recommended "irregular curved shapes" in modern store design after World War II.

Located on South Eleventh Street, between Market and Chestnut Streets, this store stands between two of the largest commercial streets in the City of Philadelphia.



Figure 64. 29 South Eleventh Street

MAB Paints	c. 1946
6215 Woodland Avenue	Figures
	65 and 66

This shop represents an excellent example of streamlining. As the whole facade sweeps around the acute corner of Woodland Avenue and Church Lane. With the sign flush to the surface and a band of flush plate glass windows, the facade is reminiscent of a train. Under the upper molding, fluorescent tubes, now disconnected, once flooded this front with light. Unfortunately, much of the glass has been lost. Evidence at the bottom of the entry doors indicates that the bulkhead may have been glass. No historic photographs surfaced during this research.

Building permit research led to no definite date for this installation, although a 1946 permit, number 1082, lists "repair of fire damage" at a cost of \$10,000, for M. A. Bruder (MAB Paints).¹⁰ Based on the somewhat "open view" into this store and production dates for orange glass, the 1946 date seems accurate.

Surviving examples of orange structural glass are rare in Philadelphia. Mr. Vince Vassa, when asked by the

author to name any significant installations in Philadelphia, recalled "truckloads" of orange glass coming in for MAB Paints.¹¹ To this author's knowledge, the only other orange MAB Paint Store, 23 East Cheltenham Avenue, has an enameled metal veneer. The signband, color scheme and form of design of the Cheltenham Avenue store match the Woodland Avenue Shop, giving cause to suspect nearly the same installation date. The building permit records, however, revealed no storefront alterations for 23 East Cheltenham Avenue.¹²

This section of Woodland Avenue is lined on both sides of the street for three blocks with small shops, servicing the surrounding neighborhood.



Figure 65. MAB Paints, looking southeast

Figure 66. MAB Paints, looking south

NOTES TO CHAPTER IV

- 1 City of Philadelphia, Pennsylvania, Department of
Licence and Inspection, Building History Records,
Permit #5594, 1935.
- 2 Ibid., #1499, 1937.
- 3 Ibid.
- 4 Conversation with Mr. Arnold Snyder, April 27, 1985;
Building History Records, Permit # 1596, 1940.
- 5 Building History Records, Permit, #99, 1940.
- 6 Ibid., #5229. 1941.
- 7 Ibid., #4345, 1946.
- 8 Ibid., #1335, 1946.
- 9 Ibid., #5416, 1950.
- 10 Ibid., #1082, 1946.
- 11 Conversation with Mr. Vincent Vassa, April 5, 1984.
- 12 Building History Records, Permit, #4979, 1946.

CONCLUSION

To complete a comprehensive study of a building material and its application which represents a specific period of history, at first has significant impact on students of historic preservation, architectural history, or American civilization. The era in which structural glass achieved its broadest popularity coincides with a complex period of American history not yet fully understood. The structural glass monuments on the streets all across America remain as a important artifacts and become the tools for scholarly interpretation of the time. It is my intention for this study to eventually contribute toward interpreting those artifacts and preserving the best of them, as well as offering a contribution to the work others, who endeavor in the study of twentieth century architecture and building materials.

Not all shopfronts containing structural glass will last, for a variety of reasons. For all of the wonderful qualities of glass, it can not stand impact. In

addition, the materials used for installing and protecting the applications are failing. Nearly every example of shopfront I observed in Philadelphia suffers some sort of deterioration. Symptoms include broken and missing glass on the bulkhead area, or loose and fallen glass on the facade, caused by water entering behind the glass and the deteriorating the mastic which keeps it attached.

Equally as damaging is the ever-present desire for merchants to keep the image of his business current or fashionable. Often, due to change in ownership, new sign bands replace the old. Both situations involve alterations which usually detract from the integrity of the shopfront, based on a lack of appreciation of the original shopfront, ignorance of its significance or misunderstanding of the principles under which it was designed. Even preservationists, unaware of its importance, sacrifice a structural glass shopfront in favor of restoration to an earlier era.

Actual preservation and restoration issues concerning structural glass shopfronts become complicated because the material is extinct. Those that desire restoration must search to find salvaged pieces, or other alternative materials. Fortunately, two good articles have been written concerning the maintenance and preservation of structural glass

applications. The first, by Douglas Yorke, appeared in the Association For Preservation Technology, entitled "Materials Conservation for the Twentieth Century: The Case for Structural Glass", Volume 3 number 8. A very good source for the technical preservation of the material, it served as the basis for Preservation Brief, Number 12, written and published by the National Park Service; a publication able to reach a larger audience.

The architecture of the 1930s and 1940s has begun to receive attention and recognition, witnessed by efforts to revitalize period movie palaces, and by the creation of the Art Deco National Register District in Miami. Educational efforts on the behalf of structural glass and its application to shopfronts of the same period need to start. In spite of the difficult issues brought on by a material that is extinct, and by the pressures of retailing, efforts must be made to preserve the best examples of structural glass shopfronts. Survey and identification of them for each locality will begin the process. Local and National designation will further the effort.

I would suggest that serious attempts be made toward salvaging glass that otherwise would be destroyed. Many municipalities have begun salvage programs. This

material belongs in the inventory. In the case of demolition, before removal, full documentation to the standards of the Historic American Building Survey should be undertaken.

Another issue this study brought forward concerns the loss of industrial records. Through telephone conversations and correspondence, both Pittsburgh Plate Glass and Libbey-Owens-Ford discarded the majority of their materials on structural glass. Despite the loss in tax benefit to the companies, product information has become an integral tool for students or professionals working with building fabric. It is my opinion that major industries need to be informed of the value of their records. With solicitation from major technical or university libraries such records would be preserved and available for use.

Structural glass is representative of twentieth century advances in building technology, radical change toward modernism through architecture and the modernization of older building fabric brought on by the Depression and World War II. It is my hope that this paper contributes to the study and appreciation of twentieth century materials and architecture. Through education and recognition, those accute to preservation and the study of architecture will learn the need to preserve such materials.

APPENDIX A MANUFACTURERS

- 1906 Pittsburgh Plate Glass, Pittsburgh, Pennsylvania
 Carrara Glass, named for the marble in
 Italy
- 1909 Marietta Manufacturing Company, Indianapolis,
 Indiana
 Sani onyx
 New York Structural Glass Company, Marbridge
 Building, 47 West 34th, New York
 "Cosmos" structural glass.
 Opalite Tile Company, Monaco, Pennsylvania
 "pure white opaque glass"
 Pittsburgh Plate Glass
- 1922-23 Hires-Turner Glass Company, Thirteenth and
 Walnut, Philadelphia, Pennsylvania
 opal glass
 Pittsburgh Plate Glass,
 Carrara
 Vitrolite Company, Parkersburg, West Virginia
 Vitrolite
- 1929 Pittsburgh Plate Glass
 Vitrolite Company
- 1935 Libbey-Owens-Ford purchases the Vitrolite
 Company
 Pittsburgh Plate Glass
- 1959 Libbey-Owens-Ford drops Vitrolite from its
 product list, (according to the 1959
 L-O-F Annual Report)
 Pittsburgh Plate Glass, (no ending date of production has
 been confirmed for PPG)

APPENDIX B COLOR

- 1906 Pittsburgh Plate Glass,
 Statuary white, jet black
- 1909 Marietta Manufacturing Company,
 white, black, gray, olive green, light
 apple green, blue, ivory,
- New York Structural Glass Company,
 white, black
- Opalite Tile Company,
 pure white
- Pittsburgh Plate Glass
 white, black
- 1922-23 Hires-Turner Glass Company
 white
 Pittsburgh Plate Glass,
 white and black
 Vitrolite Company,
 pure white
- 1929 Pittsburgh Plate Glass, (no listing)
 Vitrolite Company
 white, ivory, jade (light green), dark
 green, orchid, gray, blue and black
- 1933-34 Pittsburgh Plate Glass
 white, black, jade, ivory
 Vitrolite company
 white, ivory, jade, gray, orchid, emerald agate
 (variegated), walnut agate (variegated), ebony
 agate (variegated), jade agate (variegated),
 golden agate (variegated)
- Nuralite Company
 variegated cream, orchid, peach, green,
 rose, gray, blue.
- 1935-39 Libbey-Owens-Ford purchased the Vitrolite
 Company
 produced the Vitrolite colors; added cadet
 blue, royal, blue agate, yellow, red,
 tropic green, suntan; dropped orchid, black
 agate.

- Pittsburgh Plate Glass
 jade, ivory, gray, white, black, wine,
 rembrandt blue, orange, forest green
- 1945-47 Libbey-Owens-Ford,
 sky blue, light gray, jade, alamo tan,
 peach, white, cadet blue, dark gray, cactus
 green, red, mahogany, black
 Pittsburgh Plate Glass
 tranquil green, ivory, forest green, white,
 gunmetal, gray, spruce green, shell pink,
 rembrandt blue, wine, variegated white,
 beige
- 1959 Libbey-Owens-Ford, out of production
 Pittsburgh Plate Glass,
 white, black, ivory, gray, tranquil green,
 forest green, wine, rembrandt blue, shell pink,
 gunmetal

The following specification from the 1946 Pittsburgh Plate Glass Glass Manual, (Section B-2, Page 5.) illustrates the compounds mixed into the glass batch to produce pigment.

In general, the Carrara Glasses may be classified with the basalts and feldspars. All except black belong to the family of soda-alumina-silica glasses, which are opacified principally by the addition of sodium-silico-fluoride to the melt. This compound tends to become milky while the glass is being annealed, due to the action of the fluorine, which has an opalizing, opacifying effect. Actually, the colors are a variation of the white batch.

1. White Carrara, the original product-- a soda-alumina-silica glass, opacified with sodium-silico-fluoride.
2. Tranquil green, the same composition as white with chromium, cobalt and nickel.
3. Ivory, obtained when selenium and iron are added to the white batch as the colorants.

4. Gray, obtained when nickel, cobalt and selenium are added to white batch.
5. Beige, in which selenium is added to the white batch, as the colorant.
6. Wine, the white batch plus cupric oxide.
7. Forest green, the white batch plus chromic oxide, calcium fluoride and cuprous oxide.
8. Rembrandt blue, cobalt, nickel and calcium fluoride, plus the white batch.
9. Orange presents some deviation from the basic soda-lime-silica mixture. It is a soda-potash-alumina-silica glass, opacified with sodium-silico-fluoride and colored by the addition of cadmium-sulphide and selenium.
10. Black Carrara is an entirely normal soda-lime-silica-glass to which the coloring agents manganese and chromium have been added in considerable amounts. Manganese absorbs certain portions of the spectrum, and chromium absorbs certain other portions. Both of these oxides are oxidizing agents in the glass melt, and tend to maintain in the ferric condition any iron which may be present. [It is actually a deep red-purple.]

Although no other color specifications came to light during this study, the additional colors produced are variations of these basic colors. Production specifications for the variegated colors are not known to this author. Pittsburgh Plate Glass did not produce red glass. Libbey-Owens-Ford did; gold was used in its production.

APPENDIX C SIZES

- 1906 Pittsburgh Plate Glass,
 no mention
- 1909 Marietta Manufacturing Company,
 54" x 120" in thicknesses of: 11/22",
 7/16", 5/8", 3/4"
 New York Structural Glass Company,
 no mention
 Opalite Tile Company, Monaco, Pennsylvania
 no mention
 Pittsburgh Plate Glass
 1/2" - 2", "all sizes"
- 1922-23 Hires-Turner Glass Company,
 no mention
 Pittsburgh Plate Glass,
 1/2" - 1 1/4" in multiples of 1/4"
 Vitrolite Company,
 no mention
- 1929 Pittsburgh Plate Glass
 Vitrolite Company
 60" x 84" in thicknesses of 1/3", 11/32",
 7/16", 1/2", 5/8", 3/4"
 50" x 60" in thickness of 1"
 36" x 84" in thickness of 1 1/4"
- 1935-39 Libbey-Owens-Ford Company
 for storefronts: 6 square feet, 3' as
 maximum horizontal width and 4' as the
 maximum height
 ashlar pieces: 8" x 12" to 24" x 24"
 wainscotting: not to exceed 3' x 4'
 toilet partitions: up to 5 square feet
 Pittsburgh Plate Glass
 largest size: 72" x 130", all other sizes
 available
- 1945-47 Libbey-Owens-Ford
 same as above
 Pittsburgh Plate Glass
 same as above
- 1959 Libbey-Owens-Ford
 out of production

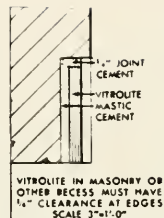
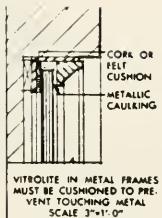
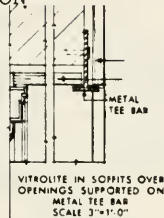
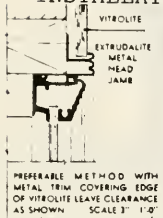
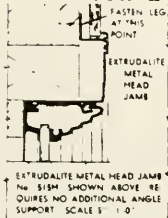
Pittsburgh Plate Glass
no mention

APPENDIX D FINISHES

- 1906 Pittsburgh Plate Glass,
no mention
- 1909 Marietta Manufacturing Company
flame glaze, matte, polychrome, embossed
and tiffanyfaience
New York Structural Glass Company,
natural, velvet, honey finish, polish
Opalite Tile Company, Monaco, Pennsylvania
"pure white opaque glass"
Pittsburgh Plate Glass
polish, honed, flat
- 1922-23 Hires-Turner Glass Company,
no mention
Pittsburgh Plate Glass,
honey (smooth no luster), satin (rich soft
distinguishing effect), polish (bright
glass surface)
Vitrolite Company, Parkersberg, West Virginia
corrugated on secondary side
- 1929 Pittsburgh Plate Glass
no mention
Vitrolite Company
back is ribbed
- 1945-47 Libbey-Owens-Ford purchases the Vitrolite
Company
fire polish, ground polish
Pittsburgh Plate Glass
suede, honed, polished, sandblasted
- 1959 Libbey-Owens-Ford
out of production
Pittsburgh Plate Glass
polished, rough texture

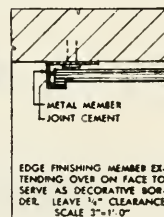
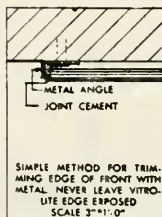
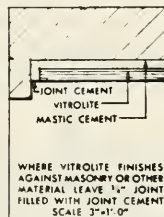
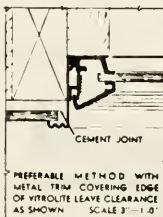
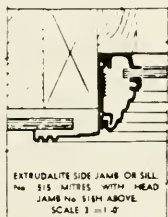
APPENDIX E

INSTALLATION



SECTIONS THRU HEAD OF SHOW WINDOWS

SECTIONS THRU SPANDRELS

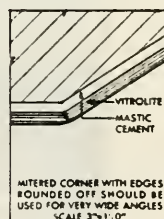
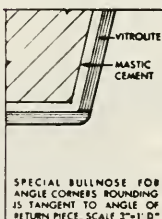
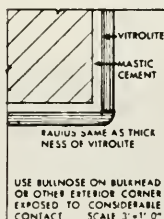
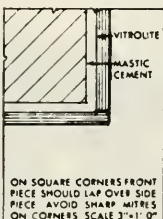
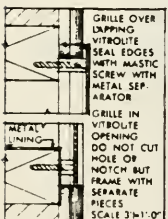


SIDE JAMB DETAILS

DETAILS

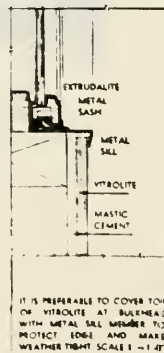
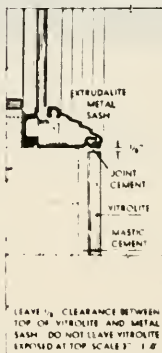
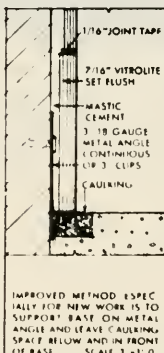
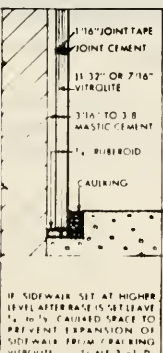
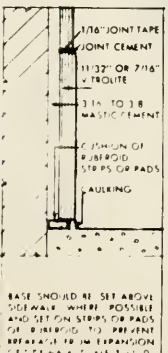
PLANS THRU

EDGES OF STORE FRONT



GRILLE DETAILS

PLANS THRU VITROLITE AT CORNERS



SECTIONS THRU BULKHEAD BASE

SILLS OF SHOW WINDOWS

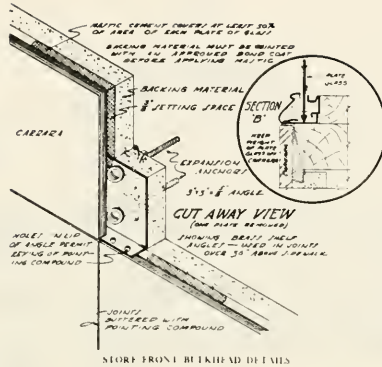


Figure 68. Store Front Bulkhead Details.



Figure 69. South Street shopfront, Philadelphia, PA. Black globs illustrate mastic installation of structural glass.

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